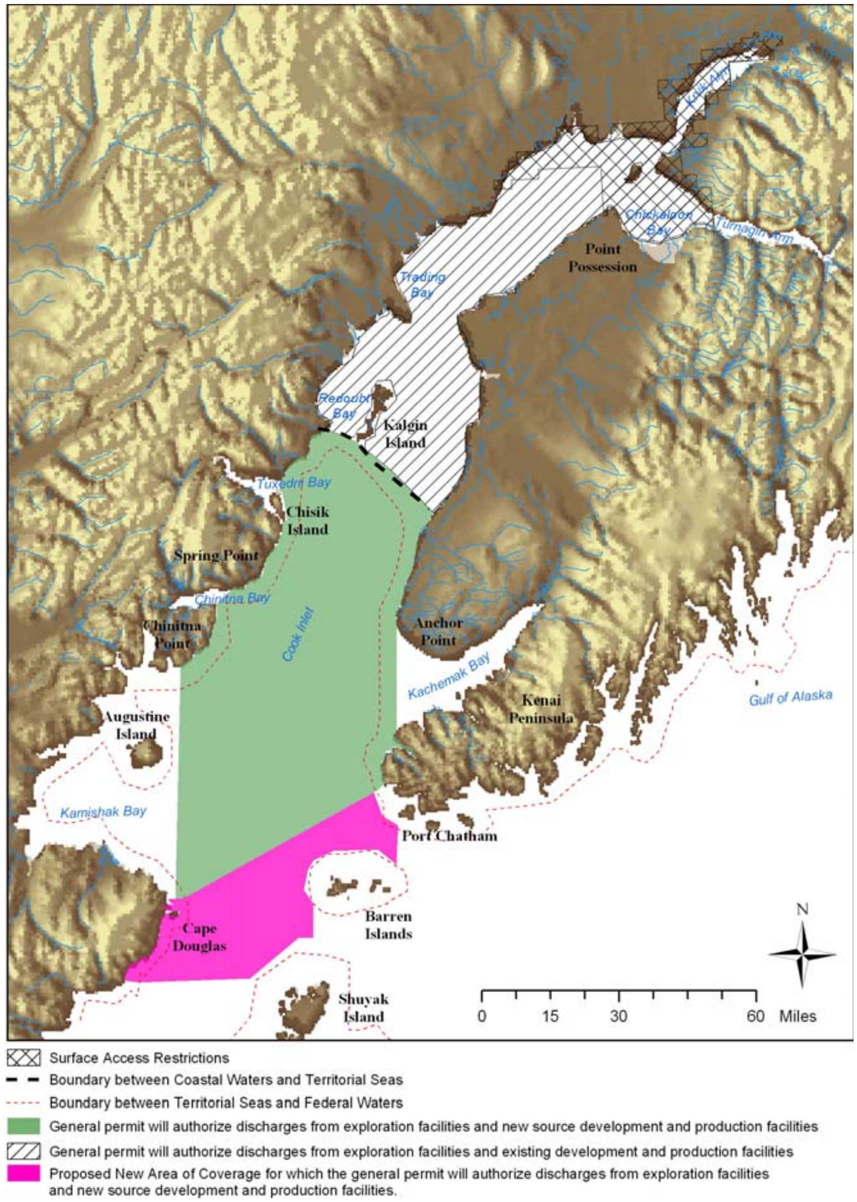
United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle, WA 98101

Alaska
Idaho
Oregon
Washington

BIOLOGICAL EVALUATION FOR THE COOK INLET NPDES PERMIT



January 20, 2006

Prepared for:

U.S. EPA, Region 10
Office of Water
NPDES Permits Unit

Prepared by:

Tetra Tech, Inc.
143 Union Blvd. Ste. 1010
Lakewood, CO 80228

TETRA TECH

CONTENTS

Page

LIST OF FIGURES iv
LIST OF TABLES v
LIST OF ACRONYMS vi

1.0 INTRODUCTION 1-1
1.1 ORGANIZATION OF BIOLOGICAL EVALUATION 1-2

2.0 PROPOSED ACTION 2-1
2.1 DESCRIPTION OF ACTION AREA 2-1
2.1.1 Restricted Areas 2-1
2.2 COVERED FACILITIES AND NATURE OF DISCHARGES 2-4
2.2.1 Exploration Facilities 2-4
2.2.2 Development Facilities 2-5
2.2.3 Production Facilities 2-5
2.2.4 Existing Facilities 2-5
2.3 AUTHORIZED ACTIVITIES UNDER THE GENERAL NPDES PERMIT 2-6
2.3.1 Technology-Based Permit Requirements 2-6
2.3.1.1 Drilling Fluids 2-6
2.3.1.2 Drill Cuttings 2-7
2.3.1.3 Produced Water 2-8
2.3.1.4 Produced Sand 2-9
2.3.1.5 Well Treatment, Completion and Workover Fluids 2-9
2.3.1.6 Deck Drainage 2-9
2.3.1.7 Sanitary Waste 2-9
2.3.1.8 Domestic Waste 2-10
2.3.1.9 Miscellaneous Discharges 2-10
2.3.1.10 Chemically Treated Seawater Discharges 2-11
2.3.1.11 Stormwater Runoff from Onshore Facilities 2-11
2.3.1.12 All Discharges 2-12
2.3.2 Water Quality-Based Permit Requirements 2-12
2.3.2.1 Alaska State Water Quality Standards 2-12
2.3.3.1 Drilling Fluids and Drill Cuttings 2-15
2.3.3.2 Deck Drainage and Stormwater Runoff 2-15
2.3.3.3 Sanitary Wastewater 2-18
2.3.3.4 Domestic Wastewater 2-19
2.3.3.5 Miscellaneous Discharges 2-20
2.3.3.6 Produced Water and Produced Sand 2-21
2.3.3.7 Fate and Effects Monitoring for Drilling Muds and Cuttings 2-22
2.3.3.8 New Study Requirements 2-22

3.0 SPECIES STATUS AND LIFE HISTORY 3-1
3.1 SNAKE RIVER FALL CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) 3-2
3.1.1 Geographic Boundaries and Spatial Distribution 3-2

3.1.2 Critical Habitat....3-2
3.1.3 Life History....3-3
3.1.4 Population Trends and Risks 3-3

3.2 SNAKE RIVER SPRING/SUMMER CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*)....3-3

3.2.1 Geographic Boundaries and Spatial Distribution 3-3
3.2.2 Critical Habitat....3-4
3.2.3 Life History....3-4
3.2.4 Population Trends and Risks 3-4

3.3 SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) 3-4

3.3.1 Geographic Boundaries and Spatial Distribution 3-4
3.3.2 Critical Habitat....3-5
3.3.3 Life History....3-5
3.3.4 Population Trends and Risks 3-5

3.4 SHORT-TAILED ALBATROSS (*PHOEBASTRAI ALBATRUS)*....3-6

3.4.1 Geographic Range and Distribution....3-6
3.4.2 Critical Habitat....3-6
3.4.3 Life History....3-6
3.4.4 Population Trends and Risks 3-7

3.5 STELLER'S EIDER (*POLYSTICTA STELLERI*)....3-7

3.5.1 Geographic Range and Distribution....3-7
3.5.2 Critical Habitat....3-8
3.5.3 Life History....3-8
3.5.4 Population Trends and Risks 3-9

3.6 BLUE WHALE *(BALEAPTERA MUSCULUS)* 3-9

3.6.1 Geographic Boundaries and Spatial Distribution 3-9
3.6.2 Critical Habitat....3-10
3.6.3 Life History....3-10
3.6.4 Population Trends and Risks 3-10

3.7 FIN WHALE *(BALAENOPTERA PHYSALUS)* 3-10

3.7.1 Geographic Boundaries and Distribution....3-10
3.7.2 Critical Habitat....3-11
3.7.3 Life History....3-11
3.7.4 Population Trends and Risks 3-11

3.8 HUMPBACK WHALE *(MEGAPTERA NOVAEANGLIAE)* 3-12

3.8.1 Geographic Boundaries and Distribution....3-12
3.8.2 Critical Habitat....3-12
3.8.3 Life History....3-12
3.8.4 Population Trends and Risks 3-13

3.9 NORTH PACIFIC RIGHT WHALE *(EUBALAENA JAPONICA)* 3-13

3.9.1 Geographic Boundaries and Distribution....3-14
3.9.2 Critical Habitat....3-14
3.9.3 Life History....3-14
3.9.4 Population Trends and Risks 3-15

3.10 SEI WHALE *(BALAENOPTERA BOREALIS)*....3-15

3.10.1 Geographic Boundaries and Distribution....3-15
3.10.2 Critical Habitat....3-16
3.10.3 Life History....3-16
3.10.4 Population Trends and Risks....3-16
3.11 SPERM WHALES *(PHYSETER MACROCEPHALUS)*....3-16
3.11.1 Geographic Boundaries and Distribution....3-17
3.11.2 Critical Habitat....3-17
3.11.3 Life History....3-17
3.11.4 Population Trends and Risks....3-17
3.12 STELLER SEA LIONS (*EUMETOPIAS JUBATUS)*....3-18
3.12.1 Geographic Boundaries and Distribution....3-18
3.12.2 Critical Habitat....3-19
3.12.3 Life History....3-19
3.12.4 Population Trends and Risks....3-19
3.13 NORTHERN SEA OTTER (*ENHYDRA LUTRIS KENYONI)*....3-20
3.13.1 Geographic Boundaries and Distribution....3-20
3.14.2 Critical Habitat....3-21
3.13.3 Life History....3-21
3.13.4 Population Trends and Risks....3-21
3.14 BELUGA WHALE (DELPHINAPTERUS LEUCAS)....3-21
3.14.1 Geographic Boundaries and Distribution....3-22
3.14.2 Critical Habitat....3-22
3.14.3 Life History....3-22
3.14.4 Population Trends and Risks....3-22
4.0 ENVIRONMENTAL BASELINE....4-1
4.1 DESCRIPTION OF ACTION AREA....4-1
4.2 BIOLOGICAL REQUIREMENTS IN ACTION AREA....4-1
4.3 CURRENT STATUS OF THE ENVIRONMENT....4-2
4.3.1 Oxygen, Phosphate, Nitrate, Nitrite, Ammonia, and Silicate in the Water Column 4-2
4.3.2 Suspended Sediments....4-3
4.3.3 Sources of Contamination....4-3
4.3.3.1 Petroleum Industry....4-3
4.3.3.2 Exploration and Production Discharges....4-3
4.3.3.3 Drilling Fluids and Cuttings....4-5
4.3.3.4 Other Discharges....4-6
4.3.3.5 Oil Spills....4-6
5.0 EFFECTS ON ENDANGERED, THREATENED, AND DEPLETED SPECIES....5-1
5.1 DESCRIPTION OF PARAMETERS OF CONCERN....5-2
5.1.1 Drilling Fluids and Cuttings....5-2
5.1.1.1 Turbidity....5-3
5.1.1.2 Chemical Toxicity....5-3
5.1.2 Produced Waters....5-5
5.1.3 Mixing Zones and Water Quality Standards....5-6
5.1.3.1 Mixing Zones....5-6

5.1.3.2 Water Quality Standards....5-6
5.2 EFFECT DETERMINATIONS....5-7
5.2.1 Snake River Fall-Run Chinook Salmon....5-7
5.2.2 Snake River Spring/Summer-Run Chinook Salmon....5-7
5.2.3 Snake River Sockeye Salmon....5-8
5.2.4 Short-Tailed Albatross....5-8
5.2.5 Steller's Eider....5-9
5.2.6 Blue Whale....5-9
5.2.7 Fin Whale....5-10
5.2.8 Humpback Whale....5-10
5.2.9 Northern Right Whale....5-11
5.2.10 Sei Whale....5-11
5.2.11 Sperm Whale....5-11
5.2.12 Northern Sea Otter....5-11
5.2.13 Steller Sea Lion....5-12
5.3 DEPLETED STOCK ASSESSMENT....5-13
5.3.1 Beluga Whale....5-13
5.4 CUMULATIVE EFECTS....5-14
5.4 INTERDEPENDENT/INTERRELATED ACTIONS....5-15
6.0 CONCLUSION....6-1
7.0 REFERENCES....7-1

LIST OF FIGURES

Number		Page
1	Area of Coverage: Cook Inlet Expired NPDES Permit AKG285000	2-2
2	Geographic area of Coverage for the Proposed General NPDES Permit	2-3

LIST OF TABLES

Table 2-1. Cook Inlet, Alaska NPDES General Permit No. AKG285000 Active Facilities.................................... 2-6
Table 2-2. Proposed and Previous Mixing Zone Radii (meters).. 2-14
Table 2-3. ADEC Calculated Dilutions 2-15
Table 2-4. Effluent Limitations and Monitoring Requirements for Drilling Fluids and Drill Cuttings (Discharge 001) 2-16
Table 2-5. Effluent Limitations and Monitoring Requirements for Deck Drainage (Discharge 002) 2-18
Table 2-6. Effluent Limitations and Monitoring Requirements for Sanitary Wastewater (Discharge 003) 2-19
Table 2-7. Effluent Limitations and Monitoring Requirements for Domestic Wastewater (Discharge 004) 2-20
Table 2-8. Effluent Limitations and Monitoring Requirements for Miscellaneous (Discharges 005-014).............. 2-20
Table 2-9. Effluent Limitations and Monitoring Requirements for Produced Water and Produced Sand............... 2-21
Table 3-1. Species Listed Under the ESA within the Geographic Area Included in the Proposed Federal Action in Cook Inlet, Alaska 3-1
Table 3-2. Summary of Critical Habitat Designations for Species Listed Under the ESA within the Geographic Area Included 3-1
Table 4-1. Cook Inlet Recorded Marine Transportation Spills.. 4-6
Table 5-1. Chemical Analyses of Produced Water Samples: Source Samples from Shelikof Strait Sediment Quality Study and Produced Water Samples from the Trading Bay Production Facility Outfall... 5-5
Table 6-1. Effects Determinations.. 6-1

LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
AMSA	Area Meriting Special Attention
API	American Petroleum Institute
BAT	Best available pollution control technology economically achievable
BCT	Best conventional pollution control technologies
BE	Biological Evaluation
BOD	Biochemical Oxygen Demand
BPT	Best Practicable Control Technology
CFR	Code of Federal Regulations
CHA	Critical habitat area
COST	Continental Offshore Stratigraphic Test
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FR	Federal Register
GC/MS	Gas Chromatography/Mass Spectrometry
gpd	Gallons per day
m	Meter
mg/L	Milligrams per liter
mL	Milliliter
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
MSD	Marine Sanitation Device
NAF	nonaqueous-based drilling fluids
NE	No Effect
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Materials
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
OCS	Outer Continental Shelf
OOC	Offshore Operators Committee
PAH	Polynuclear Aromatic Hydrocarbons
ppb	Parts per billion
ppm	Parts per million
RPE	Reverse Phase Extraction
SBFs	Synthetic-based drilling fluids
SGR	State game refuge
SGS	State game sanctuary
SPP	Suspended particulate phase
TAH	Total Aromatic Hydrocarbons
TAqH	Total Aqueous Hydrocarbons
TSS	Total Suspended Solids
USFWS	U.S. Fish and Wildlife Service
WQBEL	water quality-based effluent limitation

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA), Region 10, proposes to reissue a general National Pollutant Discharge Elimination System (NPDES) permit for oil and gas exploration, development, and production facilities in state and federal waters in Cook Inlet, Alaska. Discharges to be authorized by the proposed permit are from facilities regulated under the Coastal and Offshore Subcategory of the Oil and Gas Extraction Point Source Category (Title 40 of the *Code of Federal Regulations* [CFR], Part 435, Subparts A and D). These facilities are oil and gas operations associated with wellheads in Cook Inlet.

There are 17 offshore platforms in Cook Inlet, 13 or which are active. All but one (Osprey) of these platforms have applied for coverage under the proposed permit. There are three onshore treatment facilities along the shores of upper Cook Inlet and approximately 221 miles of undersea pipelines, 78 miles of oil pipeline, and 149 miles of gas pipeline. The NPDES general permit must be reissued to allow existing oil and gas exploration, development, and production facilities in Cook Inlet to continue operations. The proposed permit lists 23 operations that might, or might not, all operate and discharge at one time under the proposed permit. The proposed permit would authorize the following discharges in all areas of coverage:

- Drilling Fluids and Drill Cuttings
- Deck Drainage
- Sanitary Wastes
- Domestic Wastes
- Desalination Unit Wastes
- Blowout Preventer Fluid
- Boiler Blowdown
- Fire Control System Test Water
- Non-Contact Cooling Water
- Uncontaminated Ballast Water
- Bilge Water
- Excess Cement Slurry
- Mud, Cuttings, Cement at Seafloor
- Completion Fluids
- Workover Fluids
- Test Fluids
- Storm Water Runoff from Onshore Facilities

Waterflooding discharges, produced water discharges, and well treatment fluids (other than test fluids) would also be authorized for existing upper Cook Inlet development and production operations.

Section 7 of the 1973 Endangered Species Act (ESA) requires that every federal agency, in consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), ensure that any action it authorizes is not likely to jeopardize the continued existence of any species listed under the ESA or result in the destruction or adverse modification of critical habitat required by a listed species. This document (a Biological Evaluation) provides an assessment of the potential for adverse impacts to occur to endangered and threatened species or their critical habitat as a consequence of the issuance of the general NPDES permit for oil and gas exploration, development, and production facilities in Cook Inlet, Alaska.

1.1 ORGANIZATION OF BIOLOGICAL EVALUATION

This biological evaluation is organized as follows:

- **Section 1.0 – Introduction**. This section describes the regulatory authority under which the document is prepared and provides the organization of the document.

- **Section 2.0 – Proposed Action**. This section describes the federal action that is the subject of this biological evaluation and provides a description of the action area for the federal action.

- **Section 3.0 – Species Status and Life History**. This section describes the geographical range and distribution, critical habitat, ESA listing history, current known range, and status information for each of the ESA-listed species being considered in this biological evaluation.

- **Section 4.0 – Environmental Baseline**. This section provides a brief description of the action area. Biological requirements of ESA-listed species, and a characterization of baseline environmental conditions.

- **Section 5.0 – Analysis of Effects**. This section includes an analysis of the direct and indirect effects of the proposed action on the species and its critical habitat.

- **Section 6.0 – Summary**. This section summarizes the effects determinations presented in Section 5.0 for the ESA-listed species.

2.0 PROPOSED ACTION

The federal action that is the subject of this Biological Evaluation (BE) is the issuance of a general NPDES permit for oil and gas exploration, development, and production facilities in Cook Inlet, Alaska. This section of the BE describes the geographical area (Action Area) covered by the permit and provides a description of the operations and discharges that would be authorized under the permit.

2.1 DESCRIPTION OF ACTION AREA

The expired general permit authorized discharges from exploratory oil and gas extraction facilities in Cook Inlet north of a line extending between Cape Douglas (58° 51' N latitude, 153° 15' W longitude) and Port Chatham (59° 13' N latitude, 151° 47' W longitude) (Figure 1). Development and production facilities were authorized to discharge only in the northern (coastal) portion of this area of coverage. This is the area north of a line extending across the Inlet at the southern edge of Kalgin Island (Figure 1).

The Action Area of coverage for the reissued general permit will include the areas covered by the expired permit (Figure 1) and an additional area to the south in the lower portion of Cook Inlet to the northern edge of Shuyak Island (Figure 2). The expanded area of coverage includes areas under the Minerals Management Service lease sales 191 and 199 and the adjoining Territorial Seas (Figure 2).

2.1.1 Restricted Areas

The proposed general permit will contain restrictions and requirements to ensure that unreasonable degradation, as defined by the Ocean Discharge Criteria (40 CFR 125,121), will not occur. Restrictions and prohibited areas of discharge are listed below:

- No discharges in water depths less than 5 meters [mean lower low water (MLLW) isobath] for all facilities
- Exploration facilities are prohibited from discharging in waters less than the 10 meter MLLW isobath
- No discharges in Kamishak Bay west of a line from Cape Douglas to Chinitna Point
- No discharges in Chinitna Bay inside of the line between the points of the shoreline at latitude 59°52'45" N, longitude 152°48'18" W on the north and latitude 59°46'12" N, longitude 153°00'24" W on the south
- No discharges in Tuxedni Bay inside of the lines on either side of Chisik Island
    - from latitude 60°04'06" North, longitude 152°34'12" W on the mainland to the southern tip of Chisik Island (latitude 60°05'45" N, longitude 152°33'30" W)
    - from the point on the mainland at latitude 60°13'45" N, longitude 152°32'42" W to the point on the north side of Snug Harbor on Chisik Island (latitude 60°06'36" N, longitude 152°32'54" W)

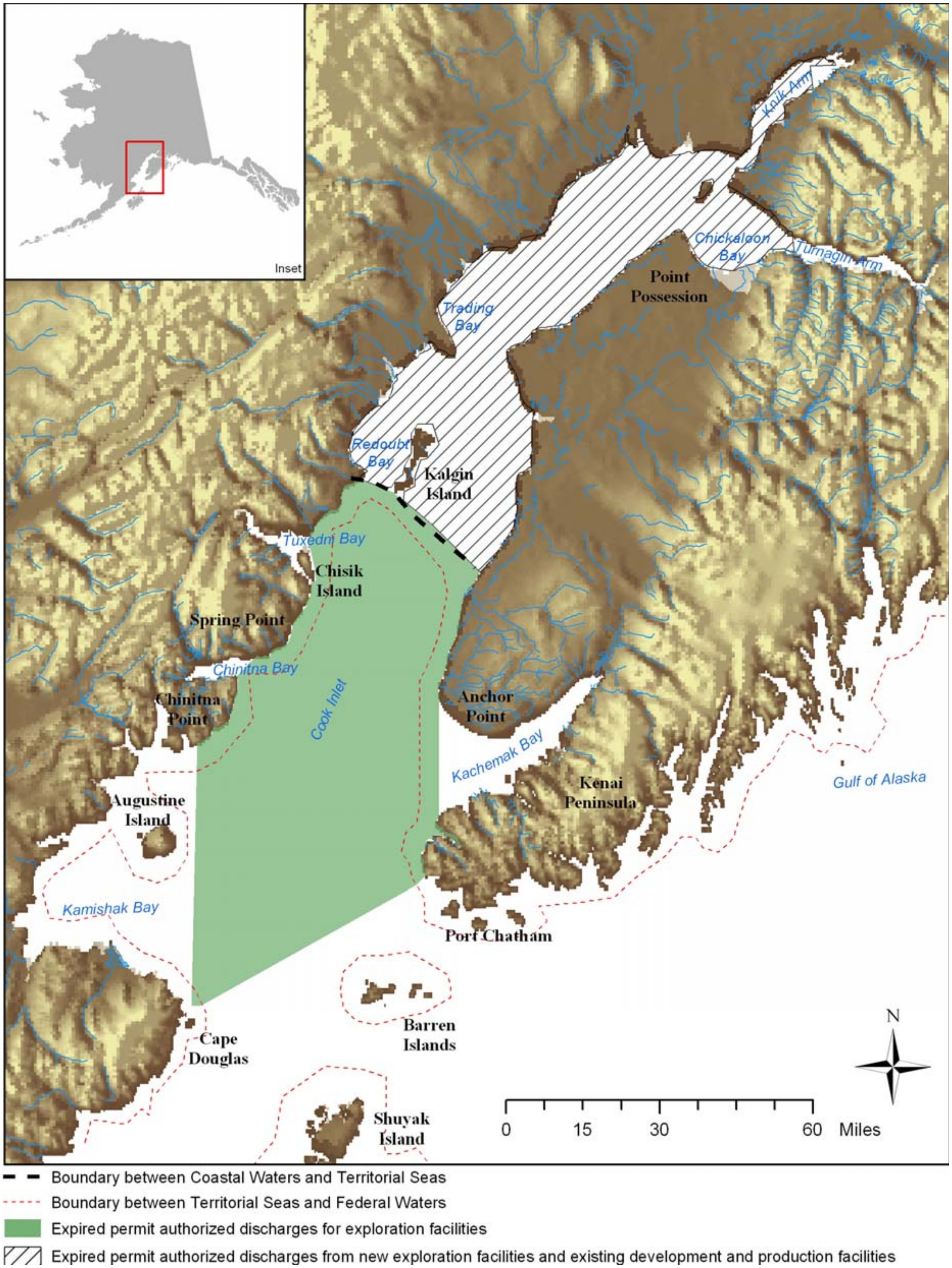


Figure 1. Area of Coverage: Cook Inlet Expired NPDES Permit AKG285000.

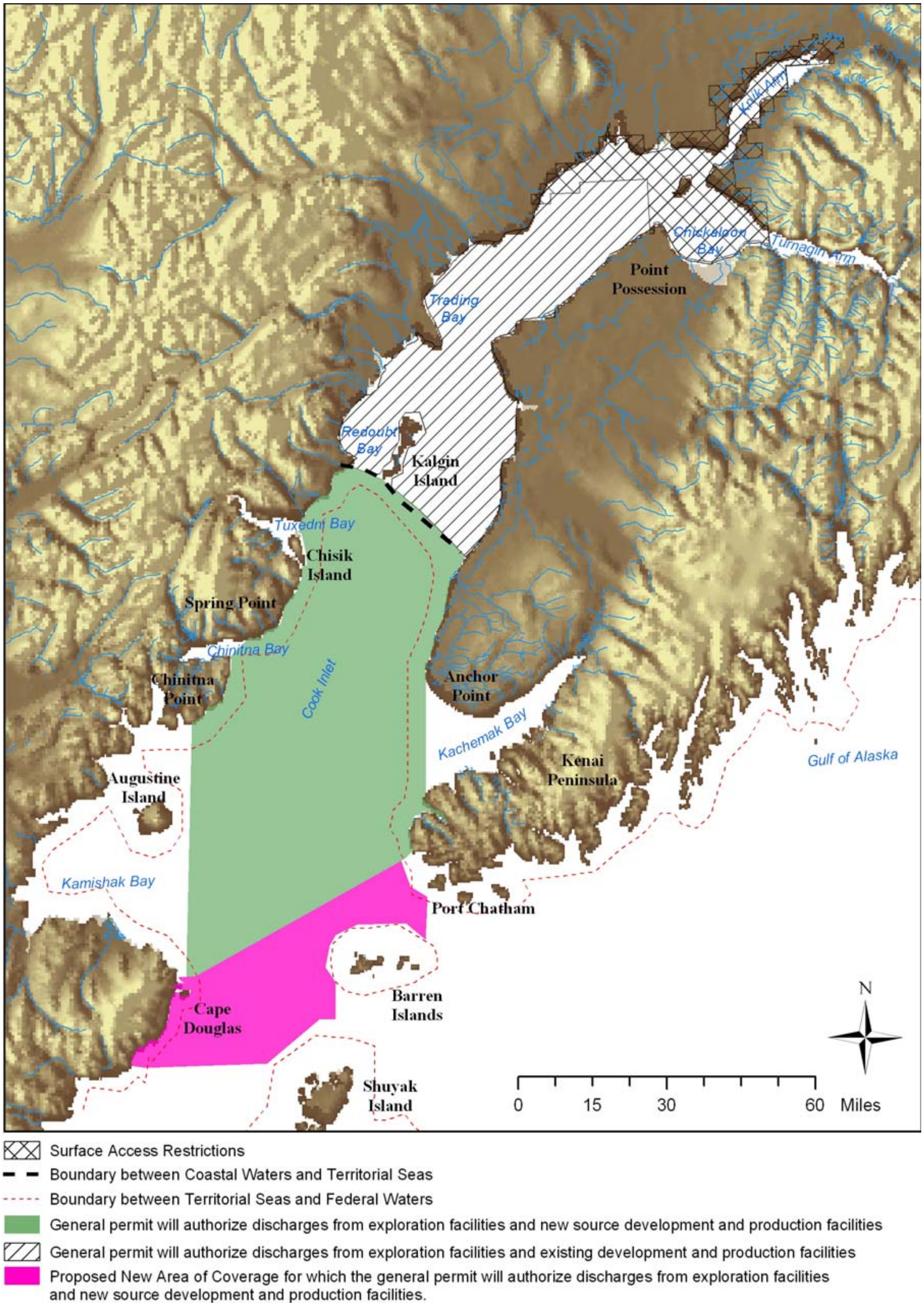


Figure 2. Geographic area of Coverage for the Proposed General NPDES Permit.

In Shelikof Strait, south of a line between Cape Douglas on the west (latitude 58°51' N, 153°15' W) and the northenmost tip of Shuyak Island on the east (latitude 58°37' N, 152°22' W)

- Minerals Management Service Lower Kenia Peninsula deferral area and Barren Island Deferral area, including the area between the deferral areas and the shore

- No discharges within 20 nautical miles of Sugarloaf Island as measured from a center point at latitude 58° 53' N and longitude 152° 02' W

- Shoreward of the 5.5 meter isobath adjacent to either (1) the Clam Gulch Critical Habitat Area (Sales 32, 40, 46A, and 49) or (2) from the Crescent River northward to a point one-half mile north of Redoubt Point (Sales 35 and 49).

- No discharges within the boundaries of, or within 4,000 meters of, a coastal marsh (the seaward edge of a coastal marsh is defined as the seaward edge of emergent wetland vegetation), river delta, river mouth, designated Area Meriting Special Attention (AMSA), State Game Refuge (SGR), state game sanctuary (SGS), Critical Habitat Area (CHA), or National Parks. Areas meeting the above classifications within the proposed area of coverage include:

Palmer Hay Flats SGR	Kachemak Bay CHA
Kalgin Island CHA	Lake Clark National Park
Susitna Flats SGR	Goose Bay SGR
Anchorage Coastal Wildlife Refuge	Clam Gulch CHA
Port Graham/Nanwalek AMSA	McNeil River SGS
Trading Bay SGR	Redoubt Bay CHA
Potter Point SGR	

- Restricted tracts identified under the Alaska Department of Natural Resources (ADNR) Division of Oil and Gas's Mitigation Measure Number 33 (including the mouth of the Susitna River and Knik and Turnagin Arms).

2.2 COVERED FACILITIES AND NATURE OF DISCHARGES

The federal action would authorize discharges from three types of facilities: exploration, development, and production facilities. Each of these types of facilities is briefly described below.

2.2.1 Exploration Facilities

Exploration for hydrocarbon-bearing strata can involve indirect methods, such as geological and geophysical surveys; however, direct exploratory drilling is the only method to confirm the presence and determine the quantity of hydrocarbons that may be present. Jackup rigs, which are barge-mounted drilling rigs with extendable legs that can be used in waters up to 300 feet deep, and semisubmersible units are the most common exploratory drilling facilities likely to used in Cook Inlet (USEPA 1996; MMS 2003). Shallow exploratory wells are typically drilled in the initial phase of exploration to discover the presence of oil and gas reservoirs; deep exploratory wells are usually drilled to establish the extent of the reservoirs (USEPA 1996). The major wastestreams discharged from exploratory facilities are drilling fluids, drill cuttings, cooling water, sanitary and domestic wastewater, and deck drainage. Exploratory wells are not expected to extract hydrocarbons and, therefore, have not been authorized for the discharge of produced waters.

MMS (2003) estimated that exploratory well depths in the southern portion of the Cook Inlet outer continental shelf would average 6,000 feet and that each well would generate approximately 150 dry tons of drilling fluids and approximately 440 dry tons of drill cuttings for disposal. Exploratory operations were limited to a maximum of five wells per site under the expired NPDES general permit.

2.2.2 Development Facilities

Development of oil and gas reservoirs requires the drilling of wells into the reservoirs to begin hydrocarbon extraction, increase hydrocarbon production, or to replace wells that are not producing on existing production sites (USEPA 1996). Operations are conducted from fixed or mobile facilities. Development wells tend to be smaller in diameter than exploratory wells because the previous information gained from exploratory drilling allows difficulties associated with the geological and geophysical properties of the subsurface strata to be anticipated. Development operations may occur either prior to, or simultaneously with, production operations. Wastestreams discharged from development operations include those that generally are discharged from exploratory facilities (drilling fluids, drill cuttings, cooling water, sanitary and domestic wastewater, and deck drainage) but can also include produced water.

MMS (2003) estimated that development/production well depths in the southern portion of the Cook Inlet outer continental shelf would average 7,500 feet and that each well would require approximately 75 dry tons of drilling fluids and generate approximately 550 dry tons of drill cuttings for disposal.

2.2.3 Production Facilities

Production operations consist of the active recovery of hydrocarbons from producing reservoirs. Facilities conducting production operations generally are not involved in exploration activities. These facilities typically discharge cooling water, sanitary and domestic wastewater, deck drainage, and produced water.

2.2.4 Existing Facilities

Eighteen facilities were active during the 5 year period from April 1, 1999 through April 1, 2004 and subject to the expired NPDES general permit within the area of coverage in Cook Inlet, Alaska (Table 2-1). Other facilities that were covered by the permit included three exploratory drilling wells (Fire Island, Sturgeon, Sunfish), Steelhead blowout relief well, and North Forelands.

Oil and gas are extracted from numerous wells associated with production and development platforms. Oil is generally produced in emulsion with water and must be separated from the water. Gas is generally produced with significantly less water than is associated with oil production. There are various ways in which oil and gas are separated from the produced water. Some of the production platforms are equipped to separate oil and gas from produced water onboard and discharge produced water directly to Cook Inlet. Other production platforms perform initial oil/water separation and route their produced water to onshore facilities (Granite Point, Trading Bay, and East Foreland) for further treatment. In these cases, produced water is discharged from the onshore facility. Under the expired NPDES general permit, produced water is an authorized discharge from the following facilities: Granite Point Treatment Facility, Trading Bay Facility, East Forelands Treatment Facility, and platforms Anna, Baker, Bruce, Platform A (Tyonek), Cross Timbers Platform A, Cross Timbers Platform C, and Spark.

Table 2-1. Cook Inlet, Alaska NPDES General Permit No. AKG285000 Active Facilities

NPDES Permit No.	Facility Name	Operator
AKG285001	Granite Point Treatment Facility	Unocal
AKG285002	Trading Bay Treatment Facility	Unocal
AKG285003	East Foreland Treatment Facility	XTO Energy
AKG285004	Platform Anna	Unocal
AKG285005	Platform Baker	Unocal
AKG285006	Platform Bruce	Unocal
AKG285007	Platform Dillon	Unocal
AKG285008	King Salmon Platform	Unocal
AKG285009	Dolly Varden Platform	Unocal
AKG2850010	Spark Platform	Marathon
AKG2850011	Platform A (Tyonek Platform)	Phillips
AKG2850012	Cross Timbers Platform A	XTO Energy
AKG2850013	Cross Timbers Platform C	XTO Energy
AKG2850014	Spurr Platform	Unocal
AKG2850015	Granite Point Platform	Unocal
AKG2850016	Grayling Platform	Unocal
AKG2850017	Monopod Platform	Unocal
AKG2850019	Steelhead Platform	Unocal

Occasionally, operators may decide to stop platform operations, ceasing production and subsequent discharges for some period of time. These facilities may resume production and discharging during the effective period of the permit. At this time, the platforms Baker, Dillon, Spurr, and Spark have ceased operations and, with the exception of deck drainage, are not discharging.

2.3 AUTHORIZED ACTIVITIES UNDER THE GENERAL NPDES PERMIT

Requirements and activities that would be authorized under the proposed general permit include technology-based permit requirements, water quality-based permit limits, and monitoring requirements

2.3.1 Technology-Based Permit Requirements

Technology-based limitations and conditions are proposed in the general permit as required under federal regulation (Effluent Limitations Guidelines, 40 CFR Part 435, Subparts A and D). These guidelines establish best practicable control technology currently available (BPT), best conventional pollution control technology (BCT), best available pollution control technology economically achievable (BAT), and new source performance standards (NSPS) for the offshore and coastal subcategories of the Oil and Gas Point Source Category. The limitations and monitoring requirements for the individual wastestreams that would be authorized by the general permit are described below.

2.3.1.1 Drilling Fluids

Drilling fluids are complex mixtures of clays, barite, and specialty additives used primarily to remove rock particles (cuttings) from the hole created by the drill bit and transport them to the surface. Other functions include cooling and lubricating the drill bit and controlling formation pressures. As the hole becomes deeper and encounters different geological formations, the type of mud, or the mud composition, may need to be changed to improve drilling performance.

The technology-based limits for drilling fluids in the expired general permit will be included in the reissued permit. Discharges of drilling fluids from New Source facilities will not be authorized.

Federal guidelines for the discharge of drilling fluids in offshore and coastal waters establish limits which are required throughout Cook Inlet. Based on those guidelines, limits and prohibitions for the proposed general permit include:

- No discharge of free oil
- No discharge of diesel oil
- Minimum toxicity limit of 3% by volume
- Cadmium and mercury in stock barite, which is added to drilling fluids, limited to 3 mg/kg and 1 mg/kg, respectively
- No discharge of nonaqueous-based drilling fluids, also known as synthetic based drilling fluids in Territorial Seas and federal waters, except those which adhere to drill cuttings as described below in section 2.3.1.2
- No discharge of oil-based drilling fluids, inverse emulsion drilling fluids, oil contaminated drilling fluids, and drilling fluids to which mineral oil has been added

Free oil in drilling fluids discharges is to be measured using the static sheen test method. Toxicity is measured with a 96-hour LC_{50} on the suspended particulate phase using the *Leptachoirus plumniosus* species. Cadmium and mercury are measured using EPA Methods 245.5 or 7471 on the stock barite prior to adding it to drilling fluids. These BAT- and NSPS-based limits apply to drilling fluids discharges throughout the proposed general permit's area of coverage.

2.3.1.2 Drill Cuttings

Drill cuttings are the waste rock particles that are brought up from the well hole during exploratory drilling operations. During typical operations, a mixture of cuttings and drilling fluid returns to the surface between the drill pipe and the bore hole. At the surface, the cuttings and fluid are separated and the cuttings are either saved for analysis or disposed of by discharge into adjacent waters. The main source of pollutants in drill cuttings are associated with the drilling fluids that adhere to the rock particles.

The technology-based limits in the expired general permit for drill cuttings for exploratory facilities will be included without modification in the reissued general permit. No discharge of cuttings will be authorized for new source development and production facilities.

The limits and prohibitions proposed for the general permit include:

- No discharge of free oil associated with cuttings discharges
- No discharge of drill cuttings generated using drilling fluids that are oil contaminated or contain diesel oil or mineral oil
- Cadmium and mercury in stock barite, which is added to drilling fluids, are limited to 3 mg/kg and 1 mg/kg, respectively

- The toxicity of suspended particulate phase of drilling fluids is limited to 30,000 ppm

While the discharge of nonaqueous-based drilling fluids will be prohibited under the proposed permit (see Section 2.3.1.1), the discharge of drill cuttings that are generated using nonaqueous-based drilling fluids is proposed to be authorized by the reissued permit. These new discharges are only proposed to be authorized in the territorial seas and federal waters in Cook Inlet. Nonaqueous-based drilling fluids, also known as synthetic-based fluids, are a pollution prevention technology because the drilling fluids are not disposed of through bulk discharge at the end of drilling. Instead, the drilling fluids are brought back to shore and refurbished so that they can be reused. Drilling with synthetic-based fluids allows operators to drill a slimmer well and causes less erosion of the well during drilling than drilling using water-based fluids. Therefore, relative to drilling with water-based fluids, the volume of drill cuttings that are discharged is reduced.

Limitations on the discharge of nonaqueous-based drilling fluids associated with cuttings are based on the Effluent Limitations Guidelines for the Oil and Gas Extraction Point Source Category (see 40 CFR Part 435, Subpart B). New limits are proposed for both the stock synthetic-base fluids that are added to drilling fluids and those drilling fluids that adhere to discharged drill cuttings. Limits that are proposed to be applied to stock base fluids include polynuclear aromatic hydrocarbons (PAH), sediment toxicity (10-day), and the biodegradation rate. Prior to its use, the drilling fluid is also limited for formation oil contamination, measured using Gas Chromatography/Mass Spectrometry (GC/MS). Drilling fluids that adhere to drill cuttings and are discharged are limited for: sediment toxicity (4-day), formation oil contamination as measured by either a reverse phase extraction test or GC/MS, and base fluids that are retained on discharged drill cuttings.

2.3.1.3 Produced Water

The term "produced water" refers to the water brought up from the oil-bearing subsurface geologic formations during the extraction of oil and gas; it can include formation water, injection water, and any chemicals added to the well hole, or added during the oil/water separation process (USEPA 1996).

All the existing development and production facilities in Cook Inlet are in coastal waters in the area north of a line extending across Cook Inlet at the southern edge of Kalgin Island (Figure 1). Federal guidelines for the coastal subcategory of oil and gas extraction point source category allow produced waters to be discharged to Cook Inlet coastal waters provided these discharges meet a monthly average oil and grease limit of 29 mg/L and a daily maximum oil and grease limit of 42 mg/L. These limits are contained in the expired general permit for produced water and will be included without modification, for existing facilities only, in the reissued general permit.

Produced waters will not be authorized for discharge in either coastal or offshore waters for new sources. Federal regulations define the term "new source" for the oil and gas extraction point source category. For Offshore Subcategory facilities (facilities in Territorial Seas or Federal Waters), NSPS were promulgated on March 4, 1993(58 FR 12454, March 4, 1993). For Coastal Subcategory facilities (those located in Coastal Waters), NSPS were promulgated on December 16, 1996 (61 FR. 66125, December 16, 1996). In simple terms, a "new source" with regard to produced waters, is a development/production facility or onshore treatment facility, that was constructed after issuance of NSPS.

The proposed general permit will include a new produced water sheen monitoring requirement that was not part of the expired general permit. Under this requirement, operators of existing facilities will observe the receiving water down-current of the produced water discharge once per day to see if there is a visible sheen. If a sheen is observed, operators will then be required to collect and analyze a produced water sample for compliance with the oil and grease limit. Observations will be required to be made during slack tide so that the turbulence, which can be present during periods of high ambient velocity does not interfere with the ability to see a sheen. Observation of a sheen will not be required at times when conditions, such as sea ice, make it difficult to see a sheen.

2.3.1.4 Produced Sand

The term "produced sand" refers to slurried particles that are the accumulated formation sands and scale particles generated during oil and gas production (USEPA 1996). It also includes de-sander discharge from the produced water wastestream and blowdown of the water phase from the produced water treating system.

The expired general permit prohibited the discharge of produced sand based on NSPS, BAT, and BCT established by the Offshore Subcategory Effluent Limitations Guidelines. This restriction will be included without modification in the reissued general permit.

2.3.1.5 Well Treatment, Completion and Workover Fluids

The term "well treatment fluids" refers to any fluid used to restore or improve the productivity of a well by chemically or physically altering the oil-bearing subsurface geologic formations (strata) after a well has been drilled. Well completion fluids are salt solutions, weighted brines, polymers, and various additives used to prevent damage to the well bore during operations that prepare the drilled well for hydrocarbon production. Workover fluids are salt solutions, weighted brines, polymers, or other specialty additives used in a producing well to allow safe repair and maintenance or abandonment procedures (USEPA 1996).

Federal guidelines for NSPS and BAT (40 CFR 435.15) for the offshore category of oil and gas extraction point sources require monthly average oil and grease limits of 29 mg/L and a daily maximum oil and grease limit of 42 mg/L for well treatment, completion, and workover fluids. A BCT ELG limit of no free oil discharge is also required for these discharge categories. These limits for produced water are contained in the expired general permit and will be included without modification in the reissued general permit.

2.3.1.6 Deck Drainage

The term "deck drainage" refers to any waste resulting from deck washings, spillage, rainwater, and runoff from gutters and drains, drip pans, and work areas (USEPA 1996). Federal guidelines for NSPS, BAT, and BCT for the offshore and coastal subcategories of the oil and gas extraction point source category require no discharge of free oil for this discharge category as determined by the presence of film, sheen, or a discoloration of the surface of the receiving water. The proposed general permit also includes new requirements for stormwater discharges for the existing onshore production facilities (see Section 2.2.3.11 for the stormwater discharge requirements).

2.3.1.7 Sanitary Waste

The term "sanitary waste" refers to human body waste discharged from toilets and urinals within facilities subject to the general permit (USEPA 1996).

The offshore and coastal subcategory ELGs for NSPS and BCT require residual chlorine to be maintained as close to 1 mg/L as possible for facilities continuously manned by 10 or more persons. The ELGs also require no discharge of floating solids for offshore facilities continuously manned by nine or fewer persons or intermittently manned by any number of persons.

The expired general permit specified a maximum Total Residual Chlorine limit of 19 mg/L and a minimum requirement of 1 mg/L. The proposed general permit will specify a maximum Total Residual Chlorine limit of 2 mg/L and maintain the existing minimum requirement of 1 mg/L for facilities located in territorial seas. The proposed general permit will specify a maximum Total Residual Chlorine limit of 13.5 mg/l and a minimum of 1mg/l only for facilities in coastal waters.

The expired general permit also included water quality based limits for biochemical oxygen demand (BOD), and total suspended solids (TSS). The proposed general permit would maintain the existing effluent limitations for these parameters in coastal waters and Territorial Seas.

2.3.1.8 Domestic Waste

The term "domestic waste" refers to materials discharged from sinks, showers, laundries, safety showers, eyewash stations, and galleys within facilities subject to the general permit (USEPA 1996).

Federal guidelines for NSPS, BAT, and BCT for the offshore and coastal subcategories of oil and gas extraction point sources require no discharge of floating solids or foam for this discharge category. This limit is contained in the expired general permit and will be included without modification in the reissued general permit.

2.3.1.9 Miscellaneous Discharges

Miscellaneous discharges that were authorized by the expired general permit include: desalination wastewater, blowout preventer fluid, boiler blowdown, fire control system test water, noncontact cooling water, uncontaminated ballast water, bilge water, excess cement slurry, muds, cuttings, and cement at the sea floor, and waterflooding wastewater. Brief definitions (USEPA 1996; 63 FR 211, January 5, 1998) of these discharges are provided below:

- desalination wastewater—wastewater associated with the process of creating fresh water from seawater
- blowout preventer fluid—fluid used to actuate hydraulic equipment on the blowout preventer
- boiler blowdown—discharge of water and minerals drained from boiler drums
- fire control system test water—water released during the training of personnel in fire protection and the testing and maintenance of fire protection equipment
- noncontact cooling water—seawater that is sometimes treated with biocide, used for noncontact, once-through cooling of crude oil, produced water, power generators, and various other pieces of machinery
- uncontaminated ballast water—tanker or platform ballast water, either local seawater or fresh water, from the location where the ballast water was pumped into the vessel
- bilge water—seawater that becomes contaminated with oil and grease and solids such as rust when it collects at low points in the bilges
- excess cement slurry—excess mixed cement, including additives and wastes from equipment washdown, after a cementing operation
- Muds, cuttings, cement at sea floor—materials discharged at the surface of the ocean floor in the early phases of drilling operations, before the well casing is set, and during well abandonment and plugging
- waterflooding discharges—discharges associated with the treatment of seawater or produced water prior to its injection into a hydrocarbon-bearing formation to improve the flow of hydrocarbons from production wells. These discharges include excess injection water and backwash from strainers and filtering systems.

The expired general permit limited these miscellaneous discharges by requiring no free oil discharges, as monitored by the visual sheen test method. Discharges of uncontaminated ballast water and bilge water were required to be treated in an oil-water separator. Bilge water discharges were required to be sampled for free oil using the static sheen test method when discharges occurred during broken, unstable, or stable ice conditions. The proposed general permit also contains a new sheen monitoring requirement for produced water discharges. However, the proposed general permit does not require the use of the static sheen methods during times when storms or ice make observation of a sheen difficult. NPDES permittees were also required to maintain a precise inventory of the type and quantity of chemicals added to water flood, noncontact cooling water, and desalinization wastewater discharges.

Federal guidelines for the offshore and coastal subcategories of oil and gas extraction point sources for this discharge category are not available. The limitations and monitoring requirements described above for the expired general permit are proposed to be included without modification, except as described below in Section 2.3.1.10, in the reissued general permit.

2.3.1.10 Chemically Treated Seawater Discharges

A broad range of chemicals to treat seawater and fresh water are used in offshore oil and gas operations; the available literature show more than 20 biocides are commonly used. Those include derivations of aldehydes, formaldehyde, amine salt, and other compounds. The toxicity of those compounds to marine organisms, as measured with a 96-hour LC_{50} test, varies substantially (0.4 mg/L to greater than 1,000 mg/L). The scale inhibitors commonly used are amine phosphate ester and phosphonate compounds. Scale inhibitors are generally less toxic to marine life than biocides with 96-hour LC_{50} concentrations shown to be from 1,676 mg/L to greater than 10,000 mg/L. Corrosion inhibitors are generally more toxic to marine life with 96-hour LC_{50} values for corrosion inhibitors reported to range from 1.98 mg/L to 1,050 mg/L.

The discharge of specific biocides, scale inhibitors, and corrosion inhibitors is not proposed to be limited in the reissued general permit. Due to the large number of chemical additives used, it would be very difficult to develop technology-based limits for each individual additive. Also, if the permit were to limit specific chemicals, it could potentially halt the development and use of new and potentially more beneficial treatment chemicals that would not be specifically listed in the permit and for which discharge would not be authorized. An additional reason for not specifying biocides is that the field conditions for each producing well can change and require different treatment over the life of the permit. Instead, chemically treated seawater discharges will be limited on the basis of the following requirements:

- The concentrations of treatment chemicals in discharges of seawater or fresh water will be limited to the most stringent of the following:
  1) the maximum concentrations and any other conditions specified in the EPA product registration labeling if the chemical additive is an EPA registered product;
  2) the maximum manufacturer's recommended concentration when one exists, or
  3) a maximum of 500 mg/L.

The Proposed Permit contains BCT limits prohibiting the discharge of free oil for chemically-treated seawater and freshwater discharges

2.3.1.11 Stormwater Runoff from Onshore Facilities

The proposed general permit would include new requirements for existing onshore production facilities. Operators of the onshore facilities will be required to develop and implement Storm Water Pollution

Prevention Plans pursuant to CWA § 402(l)(2) and 40 CFR § 122.26(c). These plans will include best management practices implemented to monitor and maintain operations to prevent contamination of stormwater. These changes will ensure greater consistency between the stormwater requirements of onshore production facilities and those typically required for shore-based industrial facilities.

2.3.1.12 All Discharges

The proposed general permit will prohibit the discharge of rubbish, trash, and other refuse based on the International Convention for the Prevention of Pollution from Ships ("MARPOL"). It will also require that the discharge of surfactants, dispersants, and detergents be minimized based on CWA Section 403(c), 33 USC § 1343(c). The Proposed Permit also prohibits the discharge of sandblasting waste pursuant to 33 C.F.R. Part 151.

2.3.2 Water Quality-Based Permit Requirements

The proposed general permit establishes water quality-based limitations and monitoring requirements necessary to ensure that the authorized discharges comply with Alaska's Water Quality Standards and with federal ocean discharge criteria (40 CFR Part 125, Subpart M and Section 403 of the Clean Water Act).

2.3.2.1 Alaska State Water Quality Standards

Section 301(b)(1)(C) of the Clean Water Act, 33 USC § 1311(b)(1)(C), and 40 CFR Part 122.44(d)(1) require that NPDES permits contain the limitations and conditions that are necessary to attain state Water Quality Standards. The expired general permit contained limits based on State Water Quality Standards for metals, hydrocarbons, and toxicity in produced water discharges. Based on updated mixing zone computations described below, the expired permit's Water Quality Standards based limitations are proposed to be recalculated. In addition, new limits for whole effluent toxicity on miscellaneous discharges to which treatment chemicals have been added are proposed. The industry uses treatment chemicals such as biocides, corrosion inhibitors, and oxygen scavengers in a number of discharges such as cooling water and water flood wastewater. Many of those chemical additives have been shown to be highly toxic. To ensure that those discharges comply with the requirements of both State Water Quality Standards and Ocean Discharge Criteria, whole effluent toxicity limitations are included in the proposed general permit.

Mixing zones are established by states and EPA to specify a limited the portion of a waterbody in which otherwise applicable water quality criteria may be exceeded. In coastal waters and Territorial Seas, states typically have the authority to define mixing zones and determine their size. Chronic aquatic life and human health criteria are limited on the basis of calculated critical dilution at the edge of the mixing zone. In general, criteria to protect aquatic life from acute toxic effects of discharges are required to be met at the edge of a smaller mixing zone called the zone of initial dilution. The zone of initial dilution is typically intended to further restrict the portion of the waterbody that is acutely toxic to aquatic life. Alaska's Water Quality Standards specify that acute water quality criteria are met at the edge of a smaller initial mixing zone (see 18 ACC 70.255(d)). Aquatic life will tend to pass through a smaller zone of initial dilution fairly rapidly and, due to the short exposure time, acute toxic affects of the discharged pollutant will be minimized. Chronic aquatic life criteria and human health criteria are based on longer term exposure of aquatic life to pollutants. Thus, mixing zones are larger than zones of initial dilution and allow for a longer exposure time.

Alaska's Water Quality Standards do not allow mixing zones to be used unless they are authorized by the Alaska Department of Environmental Conservation (ADEC). When they are authorized, the standards require mixing zones to be as small as practicable (see 18 ACC 70.240). The state regulations found at 18 AAC 70.245 require that in determining the appropriateness and size of a mixing zone, the existing uses of the waterbody must be fully protected and maintained. Numeric water quality criteria are used to measure attainment of Water Quality Standards. Although the standards allow numeric criteria for chronic aquatic life and human health protection to be exceeded within the mixing zone, they must be met at its boundary. The standards (18 AAC 70.255) also require that the smaller initial mixing zone must be sized to prevent lethality to passing organisms and that acute aquatic life criteria are met at the boundary of a smaller zone of initial dilution established within the mixing zone.

Alaska's Water Quality Standards do not allow ADEC to authorize mixing zones if the pollutants could bioaccumulate or persist in concentrations above natural levels in the environment or if they can be expected to cause a carcinogenic or other human health risk. ADEC is required to take into account the potential exposure pathways in determining whether to authorize mixing zones. ADEC has determined that the discharges authorized by the previous permit are not likely to persist in the environment and, therefore, has authorized mixing zones. Mixing zones ranging in size from 20 to 1,420 meters from the discharge point have previously been authorized by the state for Cook Inlet oil and gas facilities.

EPA developed a draft permit based on state established mixing zones based on current discharge rates and pollutant concentrations reported by the operators in their NPDES permit applications. That permit was submitted to ADEC on August 19, 2005. ADEC adopted new mixing zones based on industry's revised application and submitted that information to EPA in its draft 401 certification on November 2, 2005. As calculated by industry, those new mixing rates are based on the maximum projected discharge rates. A comparison of ADEC's August 19th and November 2nd mixing zones as well as those used to establish the previous permit's limits is shown in Table 2-2.

The new mixing zones in the proposed general permit are, in most cases, larger than those previously authorized by ADEC. The main reasons for these larger mixing zones are that a more conservative model was used in the mixing zone applications for this proposed permit (CORMIX versus Plumes) and mixing zones were established for reasonable worst case conditions.

The proposed general permit includes a new requirement for a diffuser on the Trading Bay discharge. The Trading Bay discharge is significantly greater in volume than the other discharges that will be authorized under this general permit. The discharge is also in fairly shallow water and is much nearer to sensitive areas than any other produced water discharge in Cook Inlet. Those sensitive areas include the Trading Bay State Game Refuge and the mouth of the McArthur River. Therefore, EPA has determined that additional controls are needed for the Trading Bay produced water discharge. Through dividing the effluent and discharging it through a number of separate ports, a diffuser can greatly increase mixing. Through more efficient mixing, the size area of the mixing zone can be greatly reduced. The Trading Bay discharge was examined for a number of discharge velocities, diffuser lengths, and ambient current speeds to determine a diffuser design that is technically feasible and would result in the smallest mixing zone. As a result of coordinated efforts between ADEC, the operator, and EPA, a diffuser has been designed for the Trading Bay discharge that will reduce the mixing zone length from 5,791 meters to 100 meters under most ambient current conditions. Under conditions representative of very low current speeds the mixing zone with a diffuser will be 2,418 meters. Because mixing zones were established on the basis of reasonable worst case conditions, the mixing zone approved by ADEC for Trading Bay is 2,418 meters. This much smaller mixing zone will help to ensure that any potential effects from the discharge are greatly minimized. A compliance schedule is included in the proposed permit and affords the permittee two years to design, construct, and install the diffuser.

Table 2-2. Proposed and Previous Mixing Zone Radii (meters)

Facility	Total Aromatic Hydrocarbons (TAH)/ Total Aqueous Hydrocarbons (TAqH)		Acute Metals		Chronic Metals		Whole Effluent Toxicity	
	Proposed	Previous	Proposed	Previous	Proposed	Previous	Proposed	Previous
Granite Point (Onshore)	2,685	955	19	20	21	66	780	20
Trading Bay	1,418 [a]	1,420	<1 [b]	42	9 [c]	431	31 [d]	59
East Foreland	1,794	412	142	20	121	106	1,742	20
Tyonek A	36	20	36	20	60	663	73	46
Anna	2,734	363	239	20	262	37	274	40
Bruce	1,840	867	201	20	218	31	715	58
Baker	3,016	555	202	22	216	37	248	20
Dillon	2,121	405	11	20	13	43	210	20
Granite Point (Platform)	1,863	None	12	None	14	None	533	None

a Mixing zone will be 5,791 m initially. Unocal will reduce the mixing zone to 2,418 m by installing a diffuser on a two year compliance schedule.

b Mixing zone will be 124 initially. Unocal will reduce the mixing zone to <1 m by installing a diffuser on a two year compliance schedule.

c Mixing zone will be 760 initially. Unocal will reduce the mixing zone to 9 m by installing a diffuser on a two year compliance schedule.

d Mixing zone will be 804 initially. Unocal will reduce the mixing zone to 31 m by installing a diffuser on a two year compliance schedule.

All mixing zones were derived using conditions representative of a reasonable worst case scenario. ADEC used the CORMIX dispersion model to calculate the dilution the effluent plume receives and determine where the discharges would meet Water Quality Standards. The discharges were examined for a variety of conditions. The current speed at which the discharges were modeled was found to have the most significant effect on mixing. For a single port discharge, the worst case scenario was generally found to exist at high current speeds. The worst case scenario for a discharge made through a multiple port diffuser was found to exist at low current speeds. That difference between single port discharges and diffusers is caused by changes in the receiving water dynamics created by the discharge made through a diffuser. A diffuser discharge is typically made at a high velocity through a number of ports. The diffuser line and the multiple discharges made from a diffuser cause localized instability of the currents. At high current speeds, that instability results in a very high degree of mixing relative to a discharge made through a single port. The mixing is less when current speeds are lower; however, better mixing at low current speeds can be achieved by increasing the diffuser length. For the Trading Bay discharge a diffuser that will be approximately 100 meters in length. That diffuser will accommodate a high degree of mixing at both low and high current speeds.

The number of dilutions calculated for the different produced water discharges are shown below in Table 2-3. The dilutions, calculated by CORMIX, were used to derive the numeric Water Quality Standards based limits in the permit.

Table 2-3. ADEC Calculated Dilutions

Facility	TAH/TAqH		Acute Metals		Chronic Metals		Whole Effluent Toxicity	
	Mixing Zone (m)	Dilutions	Mixing Zone (m)	Dilutions	Mixing Zone (m)	Dilutions	Mixing Zone (m)	Dilutions
Granite Point (Onshore)	2,685	7,756	19	32.2	21	35.9	780	1,638
Trading Bay	2,418 [a]	1,970	<1 [b]	20.3	9 [c]	183.3	31 [d]	346
East Foreland	1,794	2,556	142	64.6	121	55.1	1,742	1,476
Tyonek A	36	175.6	36	178.7	60	276.7	73	327
Anna	2,387	12,509	197	599.1	262	665.6	274	701
Bruce	1,447	9,170	130	496	218	550.7	715	2,625
Baker	3,016	15,668	202	151	216	168	248	210
Dillon	2,121	3,386	11	24	13	26	210	358
Granite Point (Platform)	1,863	7,756	12	32.2	14	35.9	533	1,638

a Mixing zone will be 5,791 initially. Unocal will reduce the mixing zone to 1,554 m by installing a diffuser on a two year compliance schedule.

b Mixing zone will be 124 initially. Unocal will reduce the mixing zone to 9 m by installing a diffuser on a two year compliance schedule.

c Mixing zone will be 988 initially. Unocal will reduce the mixing zone to 31 m by installing a diffuser on a two year compliance schedule.

d Mixing zone will be 83 initially. Unocal will reduce the mixing zone to <1 m by installing a diffuser on a two year compliance schedule.

2.3.3 Monitoring Requirements

Monitoring requirements for authorized discharge categories are described below.

2.3.3.1 Drilling Fluids and Drill Cuttings

The monitoring requirements for the discharge of drilling fluids and drill cuttings for the proposed general permit are specified in Table 2-4.

In addition to the requirements shown in Table 2-4, the permittee must maintain a precise chemical inventory of all constituents added down hole, including all drilling fluid additives used to meet specific drilling requirements. The permittee must maintain these records for each fluid system for a period of 5 years, and make these records available to EPA upon request.

2.3.3.2 Deck Drainage and Stormwater Runoff

The monitoring requirements for the discharge of deck drainage and stormwater for the proposed general permit are shown in Table 2-5. In addition, operators of shore-based facilities shall comply with Storm Water Pollution Prevention Plan requirements. The free oil limits and toxicity testing requirements are not proposed to be changed from those in the expired permit.

The permittee must ensure that deck drainage contaminated with oil and grease is processed through an oil-water separator prior to discharge. Once per discharge event, the permittee must sample deck drainage discharges that are processed through the oil-water separator and test for sheen, total aromatic hydrocarbons, total aqueous hydrocarbons, and polynuclear aromatic hydrocarbons.

Table 2-4. Effluent Limitations and Monitoring Requirements for Drilling Fluids and Drill Cuttings (Discharge 001)

Discharge	Pollutant Parameter	Effluent Limitation		Monitoring Requirements	
		Average Monthly Limit	Maximum Daily Limit	Measurement Frequency	Sample Type
Water-based fluids and cuttings	Suspended Particulate Phase toxicity [note 1]	Minimum 96-hour LC_{50} of 30,000 ppm		Monthly and End-of-Well	Grab
	Drilling fluids	No discharge [note 2]		Daily	Grab
	Free oil	No discharge [notes 3 & 4]		Daily	Visual
	Diesel oil	No discharge		Daily	Grab
	Mercury	1 mg/kg [note 5]		Once per well	Grab
	Cadmium	3 mg/kg [note 5]		Once per well	Grab
	Total Volume [note 2]	Report		Monthly	Estimate
	Depth Dependent Discharge Rate [note 3] 0 to 5 meters >5 to 20 meters >20 to 40 meters >40 meters	No discharge 500 bbl/hr 750 bbl/hr 1,000 bbl/hr		Continuous during discharge	Estimate
Nonaqueous fluids	Drilling fluids	No discharge		Daily	Observation
Nonaqueous stock base fluid (C_{16}-C_{18} internal olefin, C_{12}-C_{14} ester or C_8 ester)	Mercury	1 mg/kg [note 5]		Annual	Grab
	Cadmium	3 mg/kg [note 5]		Annual	Grab
	PAH [note 6]	mass ratio [note 7] $<1x10^{-5}$		Annual	Grab
	Sediment toxicity	ratio [note 8] <1.0		Annual	Grab
	Biodegradation rate	ratio [note 9] <1.0		Annual	Grab
	Total Volume	Report		Monthly	Estimate
Nonaqueous Drilling Fluids which adhere to drill cuttings (Offshore Subcategory Only)	Free oil	No discharge [note 3 and 4]		Daily	Grab
	Diesel oil	No discharge		Daily	Grab
	SPP toxicity [note 1]	Minimum 96-hour LC_{50} of 30,000 ppm		Monthly	Grab
	Sediment toxicity	Drilling fluid sediment toxicity ratio [note 10] <1.0		Annual	Grab
	Formation oil	No discharge [note 11]		Daily	Grab
	Base fluid retained on drill cuttings (C_{16}-C_{18} internal olefin stock [note 12])	6.9 g NAF base fluid/100 g wet drill cuttings [note 13]		Daily [note 15]	Grab
	Base fluid retained on drill cuttings [note 14] (C_{12}-C_{14} ester or C_8 ester stock)	9.4 g NAF base fluid/100 g wet drill cuttings [note 13]		Daily [note 15]	Grab
	Total Volume	Report		Monthly	Estimate

Footnotes:

1 As determined by the 96-hour suspended particulate phase (SPP) toxicity test. See 40 CFR Part 435, Subpart A, Appendix 1.

2 Report total volumes for all types of operations (exploratory, production and development). See Parts II.B.4.a and II.B.4.b of the permit

3 Maximum flow rate of total fluids and cuttings includes pre-dilutant water; water depths are measured from mean lower low water.

4 As determined by the static sheen test. See 40 CFR Part 435, Subpart A, Appendix 1.

5 Dry weight in the stock barite. Analysis shall be conducted using EPA Methods 245.5 or 7471. The permittee shall analyze a representative sample of stock barite once prior to drilling each well and submit the results with the DMR for the month in which drilling operations commence for the respective well. If the permittee uses the same supply of stock barite to drill subsequent wells, the permittee may submit the same analysis for those subsequent wells.

6 Polynuclear Aromatic Hydrocarbons.

7 PAH mass ratio = [mass (g) of PAH (as phenanthrene)] ÷ [mass (g) of stock base fluid] as determined by EPA Method 1654, Revision A, entitled "PAH Content of Oil by HPLC/UV," December 1992. See part III. D of the permit.

8 Base fluid sediment toxicity ratio = [10-day LC_{50} of C_{16}-C_{18} internal olefin, C_{12}-C_{14} ester or C_8 ester] ÷ [10-day LC_{50} of stock base fluid] as determined by ASTM E 1367-92 method: "Standard Guide for Conducting 10-day Static Sediment Toxicity Tests with Marine and Estuarine Amphipods," 1992, after preparing the sediment according to the method specified at 40 CFR Part 435, Subpart A, Appendix 3. See Section III.B of the permit.

9 Biodegradation rate ratio = [cumulative gas production (ml) of C_{16}-C_{18} internal olefin, C_{12}-C_{14} ester or C_8 ester] ÷ [cumulative gas production (ml) of stock base fluid], both at 275 days as determined by ISO 11734:1995 method: "Water quality - Evaluation of the 'ultimate' anaerobic biodegradability of organic compounds in digested sludge—Method by measurement of the biogas production (1995 edition)" as modified for the marine environment. See Section III.C of the permit.

10 Drilling fluid sediment toxicity ratio = [4-day LC_{50} of C_{16}-C_{18} internal olefin] ÷ [4-day LC_{50} of drilling fluid removed from drill cuttings at the solids control equipment] as determined by ASTM E 1367-92 method: "Standard Guide for Conducting 10-day Static Sediment Toxicity Tests with Marine and Estuarine Amphipods," 1992, after preparing the sediment according to the method specified in Appendix A of the permit.

11 As determined before drilling fluids are shipped offshore by the GC/MS compliance assurance method (see Section III.E of the permit), and as determined prior to discharge by the Reverse Phase Extraction (RPE) method (see Section III.F of the permit) applied to drilling fluid removed from drill cuttings. If the operator wishes to confirm the results of the RPE method, the operator may use the GC/MS compliance assurance method (Section III.E of the permit). Results from the GC/MS compliance assurance method shall supercede the results of the RPE method.

12 This limitation is applicable only when the nonaqueous drilling fluid (NAF) base fluid meets the stock limitations defined in this table.

13 As determined by the American Petroleum Institute (API) retort method. See Section III.G of the permit.

14 Averaged over all well sections.

15 Monitoring shall be performed at least once per day when generating new cuttings, except when meeting the conditions of the Best Management Practices described in section V.G. below. Operators conducting fast drilling (i.e., greater than 500 linear feet advancement of the drill bit per day using nonaqueous drilling fluids) shall collect and analyze one set of drill cuttings samples per 500 linear feet drilled, with a maximum of three sets per day. Operators shall collect a single discrete drill cuttings sample for each point of discharge to the ocean. The weighted average of the results of all discharge points for each sampling interval will be used to determine compliance.

Table 2-5. Effluent Limitations and Monitoring Requirements for Deck Drainage (Discharge 002)

Effluent Parameter	Units	Effluent Limitations		Monitoring Requirements	
		Average Monthly Limit	Maximum Daily Limit	Sample Frequency	Sample Type
Free oil	---	No discharge note 1		Daily note 2	Visual
Whole effluent toxicity note3	TUc note5	Report		Once during the first year the permittee is covered by the permit note 4	Part III.A
Flow	MGD	—		Monthly	Estimated

Footnotes:
1 If discharge occurs during broken or unstable ice conditions, or during stable ice conditions, the Static Sheen Test must be used (see Appendix 1 to 40 CFR part 435, subpart A).
2 When discharging.
3 Contaminated deck drainage must be processed through an oil-water separator prior to discharge and samples for that portion of the deck drainage collected from the separator effluent must be sampled for WET testing.
4 Sample must be collected during a significant rainfall or snow melt. If discharge of deck drainage separate from produced water is initiated after the first year of the permit, sampling must occur during the year following the initiation of separate deck drainage discharge.
5 With the final report for each test, the following must also be reported: date and time of sample, the type of sample (i.e., rainfall or snow melt), estimate of daily flow and basis for the estimate (e.g., turbine meters, monthly precipitation, estimated washdown).

If deck drainage is commingled with produced water, this discharge must be considered produced water for monitoring purposes. However, samples collected for compliance with the produced water oil and grease limits shall be taken prior to commingling the produced water stream with deck drainage or any other wastestream. Monitoring for compliance with the free oil prohibition must be accomplished prior to commingling. The estimated deck drainage flow rate must be reported in the comment section of the discharge monitoring report (DMR).

2.3.3.3 Sanitary Wastewater

The monitoring requirements for the discharge of sanitary wastewater for the proposed general permit are shown in Table 2-6.

The term M10, used in Table 2-6, refers to platforms continuously manned by 10 or more persons. The term M9IM refers to platforms continuously manned by 9 or fewer persons or intermittently manned by more persons. Intermittently manned means manned for fewer than thirty consecutive days.

For any facility using a marine sanitation device (MSD), the permittee must conduct annual testing of the MSD to ensure that the unit is operating properly. The permittee must note on the December Discharge Monitoring Report (DMR) the results of the test.

In cases where the sanitary and domestic wastes are mixed prior to discharge and sampling of the sanitary waste component of the discharge is infeasible, the discharge may be sampled after mixing, however, the most stringent discharge limitations for both discharges apply to the mixed wastestream.

Table 2-6. Effluent Limitations and Monitoring Requirements for Sanitary Wastewater (Discharge 003)

Discharge	Effluent Parameter	Effluent Limitations		Monitoring Requirements	
		Monthly Avg. Limit	Daily Max. Limit	Sample Frequency	Sample Type
Sanitary Waste Water All Discharges note 2	Flow Rate	Report		1/Month	Estimate
	Total Residual Chlorine	1 mg/l Minimum note 5		1/Month	Grab
	Total Residual Chlorine	7 mg/l note 6		1/Month	Grab
	Floating Solids	No Discharge		1/Day	Observation note 1
M10 MSD and MSD/Biological Treatment Units	BOD note 3	30 mg/l	60 mg/l	1/Month	Grab
	TSS note 3	51 mg/l	67 mg/l	1/Month	Grab
M9IM MSD and MSD/Biological Treatment Units	BOD note 3	30 mg/l	60 mg/l	1/Month	Grab
	TSS note 3	51 mg/l	67 mg/l	1/Month	Grab
M10 Biological Treatment Units	BOD note 3	30 mg/l	60 mg/l	1/Month	Grab
	TSS note 3, 4	30 mg/l	60 mg/l	1/Month	Grab
M9IM Biological Treatment Units	BOD note 3	48 mg/l	90 mg/l	1/Month	Grab
	TSS note 3, 4	56 mg/l	108 mg/l	1/Month	Grab

Footnotes:

1 The permittee must monitor by observing the surface of the receiving water in the vicinity of the outfall(s) during daylight at the time of maximum estimated discharge. For domestic waste, observations must follow either the morning or midday meal.

2 In cases where sanitary and domestic wastes are mixed prior to discharge, and sampling of the sanitary waste component stream is infeasible, the discharge may be sampled after mixing. In such cases, the discharge limitations for sanitary wastes must apply to the mixed wastestream.

3 The numeric limits for BOD and TSS apply only to discharges to state waters.

4 The TSS limitation for biological treatment units is a net value. The net TSS value is determined by subtracting the TSS value of the intake water from the TSS value of the effluent. Report the TSS value of the intake water on the comment section of the DMR. For those facilities that use filtered water in the biological treatment units, the TSS of the effluent may be reported as the net value. Samples collected to determine the TSS value of the intake water must be taken on the same day, during the same time period that the effluent sample is taken. Intake water samples must be taken at the point where the water enters the facility prior to mixing with other flows. Influent samples must be taken with the same frequency that effluent samples are taken.

5 Immediately after chlorination.

6 Measured immediately prior to discharging for facilities located in the Territorial Seas.

2.3.3.4 Domestic Wastewater

The monitoring requirements for the discharge of domestic wastewater for the proposed general permit are shown in Table 2-7.

Table 2-7. Effluent Limitations and Monitoring Requirements for Domestic Wastewater (Discharge 004)

Discharge	Effluent Parameter	Effluent Limitations		Monitoring Requirements	
		Average Monthly Limit	Maximum Daily Limit	Sample Frequency	Sample Type
Domestic Wastewater (004) note 2	Flow Rate	Report		1/Month	Estimate
	Floating Solids	No Discharge		1/Day note 1	Visual
	Foam	No Discharge		1/Day	Visual

Footnotes:

1 The permittee must monitor by observing the surface of the receiving water in the vicinity of the outfall(s) during daylight at the time of maximum estimated discharge. For domestic waste, observations must follow either the morning or midday meal.

2 In cases where sanitary and domestic wastes are mixed prior to discharge, and sampling of the sanitary waste component stream is infeasible, the discharge may be sampled after mixing. In such cases, the discharge limitations for sanitary wastes must apply to the mixed wastestream.

In cases where the sanitary and domestic wastes are mixed prior to discharge, and sampling of the sanitary waste component of the discharge is infeasible, the discharge may be sampled after mixing, however, the most stringent discharge limitations for both discharges apply to the mixed wastestream.

2.3.3.5 Miscellaneous Discharges

The monitoring requirements associated with the discharge of miscellaneous categories (desalination unit wastes, blowout preventer mud, boiler blowdown, fire control system test water, noncontact cooling water, uncontaminated ballast water, bilge water, excess cement slurry, mud, cuttings, cement at the sea floor, and waterflooding, must comply with the following effluent limitations and monitoring requirements shown in Table 2-8.

Table 2-8. Effluent Limitations and Monitoring Requirements for Miscellaneous (Discharges 005-014)

Parameter	Effluent Limitations		Monitoring Requirements	
	Average Monthly Limit	Maximum Daily Limit	Sample Frequency	Sample Type
Flow	Report		Monthly	Estimate
Free Oil	No discharge note 1	No discharge note 1	Once/Week note 1	Visual
Chemical Additives	See Section II.F.3 of the draft permit		Monthly	Calculation
Whole Effluent Toxicity note 2	See Section II.F.4 of the draft permit	See Section II.F.4 of the draft permit	Once/Quarter	Grab

Footnotes:

1 Discharge is limited to those times that a visible sheen observation is possible unless the operator uses the static sheen method. Monitoring shall be performed using the visual sheen method on the surface of the receiving water once per week during periods of slack tide when discharging, or by use of the static sheen method at the operator's option. The number of days a sheen is observed must be recorded. For discharges during stable ice, below ice, to unstable ice or broken ice conditions, a water temperature that approximates surface water temperatures after breakup shall be used.

2 Applicable to discharges to which chemical additives have been added.

In addition to the monitoring requirements specified in Table 2-8, permittees must maintain an annual inventory of the quantities and rates of chemicals and biocides that are added to desalination unit wastewater. Each annual inventory must be assembled for the calendar year and submitted to EPA by March 1 of the following year.

2.3.3.6 Produced Water and Produced Sand

The monitoring requirements for produced water discharged from existing facilities are shown in Table 2-9. There are no monitoring requirements for produced sand because no discharges are allowed.

Table 2-9. Effluent Limitations and Monitoring Requirements for Produced Water and Produced Sand

Parameter	Effluent Limitations		Monitoring Requirements	
	Monthly Avg.	Daily Max.	Sample Frequency	Sample Type
Flow Rate	Report	Report	1/Week	Estimate
Produced Sand	No Discharge	No Discharge		
Oil and Grease	29 mg/L	42 mg/L	1/Week	Grab note 1
pH < 1 MGD	6.0 to 9.0 S.U.		1/Month	Grab
pH > 1 MGD	6.0 to 9.0 S.U.		1/Week	Grab
Free Oil	Report note 2		1/Day note 2	Visual Sheen

Footnotes

1 The sample type shall be either grab, or a 24-hour composite, which consists of the arithmetic average of the results of four grab samples taken over a 24-hour period. If only one sample is taken for any one month, it must meet both the daily and monthly limits. Samples shall be collected prior to the addition of any seawater to the produced water wastestream.

2 See Section II.G.6.b of the draft permit.

In addition to the monitoring requirements shown in Table 2-9, produced waters are required to be analyzed once a month for TAH and TAqH in accordance with analytical requirements cited in Alaska Water Quality Standards (18 AAC 70.020(b)); once a month for ammonia, total copper, total mercury, total manganese, total nickel, and total zinc; and once a quarter for whole effluent toxicity.

The proposed general permit will reduce the monitoring frequency of produced water if the permittee has complied with the water quality-based effluent limitations (WQBELs) (compliance with water quality limits are determined using measured sample results and the application of the dilution factors shown in Table 2-3 for the mixing zones proposed in Table 2-2) for 12 consecutive months. If compliance is achieved for 12 consecutive months the monitoring frequency of TAH, TAqH, ammonia, total copper, total mercury, total manganese, total lead, total nickel, and total zinc would be reduced to once per quarter; the monitoring frequency for whole effluent toxicity would be reduced to once every 6 weeks.

The proposed general permit will increase the monitoring frequency of produced water if the permittee has not complied with the WQBELs until compliance has been demonstrated for a period of 3 consecutive months. After compliance has been established for 3 months, the required frequency shall return to the default frequency of one sample per month (TAH, TAqH, ammonia, total copper, total mercury, total manganese, total lead, total nickel, and total zinc) or one sample per quarter whole effluent toxicity). The increased monitoring frequency is once per week for TAH, TAqH, ammonia, total copper, total, mercury, total nickel, and total zinc, and once per month for whole effluent toxicity.

2.3.3.7 Fate and Effects Monitoring for Drilling Muds and Cuttings

The expired general permit required operators of new exploration facilities that were within 4,000 meters of sensitive areas such as a coastal marsh, river delta, or river mouth, or a designated AMSA, State Game Refuge, State Game Sanctuary, Critical Habitat Area, or National Park to conduct baseline monitoring of the fate and effects of drilling muds and cuttings discharges. There were, however, no new exploration facilities that were within 4,000 meters of sensitive areas, so no baseline monitoring was conducted under the expired permit. To fulfill EPA's requirements under Clean Water Act (CWA) section 403(c), which requires that the potential impacts of permitted discharges be fully understood, the monitoring requirement from the expired general permit is proposed to be extended to cover all new facilities installed after the effective date of the new permit.

2.3.3.8 New Study Requirements

Little ambient data associated with oil and gas discharges in Cook Inlet presently exists. The only available sediment data were collected in the far southern portions of Cook Inlet, well over 100 miles from the existing large volume produced water discharges. While those data could indicate whether general contamination exists, due to the collection location, there is no way to draw a connection to the existing produced water discharges. Available ambient water column data relevant to the existing discharges are also extremely limited. Because of the data limitations, EPA has historically relied on tools such as dispersion modeling to analyze the potential effects of discharges for permitting decision making.

As a means to increase available ambient data and ensure that future permit decisions are based on a better body of information, the proposed general permit will require new fate and effects monitoring for large volume produced water discharges. Under this new requirement, operators of produced water discharges greater than 100,000 gallons per day will be required to conduct a sediment and water column sampling study. The goal of the study is to determine if there is a reasonable potential for large volume produced water discharges to impact sensitive areas of Cook Inlet. To achieve that goal, the permit is proposed to require that operators plan and conduct studies that, at a minimum, would include the collection of both sediment and water column samples at 50 meter intervals over a distance of 2,000 meters between the discharge point and the closest sensitive habitat. Sediment sampling will be accomplished by a minimum of one box core or similar sample collected at each station. At a minimum, water column monitoring will include collection of a sample from both the mid- and lower-water column at each station. All samples will be analyzed for the metals and hydrocarbons that are limited in produced water discharges. Operators with large volume produced water discharges will be required to submit a study plan to EPA for approval prior to the commencement of monitoring. Because the studies will be in areas within Alaska State waters, EPA plans to coordinate review of the study plans with ADEC and obtain input as a part of the approval process. Therefore, the plan will also be required to be submitted to ADEC.

Pursuant to the Ocean Discharge Criteria, EPA is required to fully understand the potential impacts to the marine environment of future large volume discharges that may be placed in Cook Inlet. The information obtained from these studies will help EPA comply with the requirements of Ocean Discharge Criteria Evaluations in future permitting actions. In addition, the information will be used by both EPA and ADEC to determine whether any future changes are needed to the permit conditions to meet the requirements of Alaska's Water Quality Standards.

3.0 SPECIES STATUS AND LIFE HISTORY

Information provided by NMFS and the USFWS on the distribution of threatened and endangered species was consulted to identify 12 species of interest for consideration in the Biological Evaluation. Table 3-1 shows a list of these species, their current status, and the *Federal Register* (FR) final rule notice for each species. The Cook Inlet stock of beluga whales has been designated as depleted under the Marine Mammal Protection Act (MMPA) and are a federal species of concern; therefore, beluga whales are also addressed under this section (NMFS 2000c).

Table 3-1. Species Listed Under the ESA within the Geographic Area Included in the Proposed Federal Action in Cook Inlet, Alaska

Species	Population	Present Status	***Federal Register*** **Notice**	
Chinook Salmon	Snake River fall run	Threatened	57 FR 14653	04/22/92
	Snake River spring/summer run	Threatened	57 FR 14653	04/22/92
Sockeye Salmon	Snake River	Endangered	56 FR 58619	11/20/91
Short-tailed Albatross	U.S. waters	Endangered	65 FR 46643	7/31/00
Steller's Eider	Alaska	Threatened	62 FR 31748	6/11/97
Blue Whale	North Pacific	Endangered	35 FR 8495	6/2/70
Fin Whale	Northeast Pacific	Endangered	35 FR 8491 35 FR 8498	6/2/70 6/2/70
Humpback Whale	North Pacific	Endangered	35 FR 8491	6/2/70
Northern Right Whale	North Pacific	Endangered	35 FR 8495 68 FR 17560	6/2/70 4/10/03
Sei Whale	North Pacific	Endangered	35 FR 8498	6/2/70
Sperm Whale	North Pacific	Endangered	35 FR 8495	6/2/70
Northern Sea Otter	Southwest Alaska	Threatened	70 FR 46366	8/9/05
Steller Sea Lion	Western (West of 144 EW longitude) Eastern (East of 144E W longitude)	Endangered Threatened	62 FR 24355 62 FR 24345	5/5/97 5/5/97

Table 3-2 provides the FR notices for critical habitat for these species. Each of these species is discussed in subsequent sections.

Table 3-2. Summary of Critical Habitat Designations for Species Listed Under the ESA within the Geographic Area Included

Species	Population	Present Status	***Federal Register*** **Notice**	
Chinook Salmon	Snake River Fall Run	Final Rule	58 FR 68543 (modified 63 FR 11515)	12/28/93 3/9/98
	Snake River Spring/Summer Run	Final Rule	58 FR 68543	12/28/93
Sockeye Salmon	Snake River	Final Rule	58 FR 68543	12/28/93
Short-tailed Albatross	U.S. waters	Not Designated	65 FR 46643	7/31/00
Steller's Eider	Alaska	Final Rule	66 FR 8849	2/2/01
Blue Whale	North Pacific	Not Designated	-	-
Fin Whale	Northeast Pacific	Not Designated	-	-
Humpback Whale	Central North Pacific	Not Designated	-	-
Northern Right Whale	North Pacific	Not Designated	67 FR 7660	2/20/02

Species	Population	Present Status	*Federal Register* Notice	
Sei Whale	North Pacific	Not Designated	-	-
Sperm Whale	North Pacific	Not Designated	-	-
Northern Sea Otter	Southwest Alaska	Not Designated	-	-
Steller Sea Lion	Western (West of 144E W longitude)	Not Designated	-	-

3.1 SNAKE RIVER FALL CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*)

Chinook salmon are anadromous and semelparous meaning that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Seasonal “runs” (i.e., spring, summer, fall, or winter) have been identified on the basis of when adult chinook salmon enter fresh water to begin their spawning migration. Because genetic analyses indicate that fall-run chinook salmon in the Snake River are a distinct evolutionarily significant unit (ESU) from the spring/summer-run in the Snake River Basin (Waples et al. 1991), Snake River fall-run chinook salmon are considered separately. NMFS clarified the status of both ESUs as threatened in 1992 (NMFS 1992).

Two distinct races have evolved among chinook salmon. The “stream-type” race of chinook salmon, is found most commonly in headwater streams. Steam-type chinook salmon have a longer fresh water residency, and demonstrate extensive offshore migrations into the North Pacific before returning to their natal streams in the spring or summer months (NMFS 1998; Healy 1991). The “ocean-type” chinook, including the Snake River fall-run chinook salmon ESU are commonly found in coastal streams in North America. Ocean-type chinook migrate to sea where they tend to spend their ocean life in coastal waters within about 1,000 km from their natal river (NMFS 1998; Healy 1991). Ocean-type chinook salmon return to their natal streams or rivers in spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. The difference between these life history types is also physical, with both genetic and morphological foundations (NMFS 1998).

3.1.1 Geographic Boundaries and Spatial Distribution

The Snake River includes the mainstem river and all tributaries, from their confluence with the Columbia River to the Hells Canyon Dam complex. Stock-specific information on spatial and temporal distribution of Snake River chinook salmon within the marine environment are primarily based on the recovery of coded-wire tagged chinook salmon under the U.S. North Pacific Groundfish Observer Program. These observations indicate that North American chinook salmon, including the Snake River ESUs, range across almost the entire Bering Sea, north to 60°03’N and west to 172°12’E. In the North Pacific, the known ocean range of North American chinook salmon extends north from about 40°N (in the coastal waters just off California) and west to the waters just south of Adak Island in the central Aleutians (176°34’W, 51°29’N) (HSSRP 2004).

3.1.2 Critical Habitat

The critical habitat for the Snake River fall chinook salmon was listed on December 28, 1993 (NMFS 1993a) and modified on March 9, 1998 (NMFS 1998), to include the Deschutes River in Oregon. The designated critical habitat does not include any waters within the state of Alaska. It does include all river reaches accessible to chinook salmon in the Columbia River from The Dalles Dam upstream to the confluence with the Snake River in Washington (inclusive). Critical habitat in the Snake River includes its tributaries in Idaho, Oregon, and Washington (exclusive of the upper Grande Ronde River and the Wallowa River in Oregon, the Clearwater River above its confluence with Lolo Creek in Idaho, and the

Salmon River upstream of its confluence with French Creek in Idaho). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Areas above specific dams or above longstanding, naturally impassable barriers (e.g., natural waterfalls in existence for at least several hundred years) are excluded (NMFS 1998).

3.1.3 Life History

Fall-run chinook salmon in this ESU are ocean-type. Adults return to the Snake River at ages 2 through 5, with age 4 most common at spawning (Chapman et al. 1991). Spawning, which takes place in late fall, occurs in the mainstem and in the lower parts of major tributaries (NWPPC 1989; Waples et al. 1991). Juvenile fall-run chinook salmon move seaward slowly as subyearlings, typically within several weeks of emergence (Chapman et al. 1991).

3.1.4 Population Trends and Risks

Almost all historical Snake River fall-run chinook salmon spawning habitat in the Snake River Basin has been blocked by the Hells Canyon Dam complex; other habitat blockages have also occurred in Columbia River tributaries. The ESU's range has also been affected by agricultural water withdrawals, grazing, and vegetation management within the Columbia and Snake river basins. The continued straying by nonnative hatchery fish into natural production areas is an additional source of risk.

The historical population of Snake River fall-run chinook salmon is difficult to estimate. Irving and Bjornn (1981) estimated a population of 72,000 for the period of 1938 to 1949 that declined to 29,000 during the 1950s. Numbers declined further following completion of the Hells Canyon Dam complex. The Snake River component of the fall-run chinook has been increasing during the past few years as a result of hatchery and supplementation efforts in the Snake and Clearwater River Basins. In 2002, more than 15,200 fall-run chinook were counted past the two lower dams on the Snake River, with about 12,400 counted above Lower Granite Dam. These adult returns are about triple the 10-year average at these Snake River projects (FPC 2003). For the Snake River fall-run chinook salmon ESU, National Oceanic and Atmospheric Administration (NOAA) Fisheries estimates that the median population growth rate (lambda) over a base period from 1980 through 1998 ranges from 0.94 to 0.86. The decrease in growth rate reflects the increased effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure et al. 2000).

3.2 SNAKE RIVER SPRING/SUMMER CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*)

3.2.1 Geographic Boundaries and Spatial Distribution

Snake River spring/summer-run chinook salmon are found in several subbasins of the Snake River (CBFWA 1990). Of these, the Grande Ronde and Salmon Rivers are large, complex systems are composed of several smaller tributaries that are further composed of many small streams. In contrast, the Tucannon and Imnaha Rivers are small systems with most salmon production in the main river. In addition to these major subbasins, three small streams, Asotin, Granite, and Sheep Creeks, which enter the Snake River between Lower Granite and Hells Canyon Dams, provide small spawning and rearing areas. Some indications that multiple ESUs may exist within the Snake River Basin spring and summer runs have been demonstrated; however, the available data do not clearly demonstrate their existence or define their boundaries (CBFWA 1990). The Snake River spring and summer chinook salmon runs are, therefore, considered a single ESU.

The Snake River spring/summer chinook salmon are of the stream-type, meaning they have a longer fresh water residency and demonstrate extensive offshore migrations into the North Pacific before returning to their natal streams in the spring or summer months (NMFS 1998; Healy 1991). Stock-specific information on spatial and temporal distribution of Snake River chinook salmon within the marine environment are limited and primarily from the recovery of coded-wire tagged chinook salmon under the U.S. North Pacific Groundfish Observer Program. These observations indicate that North American chinook salmon, including the Snake River spring/summer ESU, range widely across the North Pacific, extending from about 40°N (in the coastal waters just off California), north to the Gulf of Alaska and west to the waters just south of Adak Island in the central Aleutians (176°34'W, 51°29'N) (HSSRP 2004).

3.2.2 Critical Habitat

The critical habitat for the Snake River spring/summer chinook salmon was listed in 1993 (NMFS 1993a). The designated habitat consists of river reaches of the Columbia, Snake, and Salmon Rivers, and all tributaries of the Snake and Salmon Rivers (except the Clearwater River) presently or historically accessible to Snake River spring/summer chinook salmon (except reaches above impassable natural falls and Hells Canyon Dam).

3.2.3 Life History

The Snake River spring/summer-run chinook salmon ESU are stream-type fish, with juveniles that migrate to sea as yearling smolts. Depending on location within the basin (and not on run type), adults tend to return after either 2 or 3 years in the ocean. Most Snake River spring/summer chinook salmon enter individual subbasins from May through September. Juvenile Snake River spring/summer chinook salmon emerge from spawning gravels from February through June (Bjornn and Peery 1992). After rearing in their nursery streams for about 1 year, smolts begin migrating seaward from April through May (Waples et al. 1991; Cannamela 1992). After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit near-shore areas before beginning their Pacific Ocean migration.

3.2.4 Population Trends and Risks

Recent trends in redd counts in major tributaries of the Snake River indicate that many subpopulations could be at critically low levels. Subpopulations in the Grande Ronde River, Middle Fork Salmon River, and Upper Salmon River Basins are at particularly high risk. Both demographic and genetic risks would be of concern for such subpopulations, and in some cases, habitat may be so sparsely populated that adults have difficulty finding mates. NOAA Fisheries estimates that the median population growth rate (lambda) over a base period from 1980 through 1998 ranges from 0.96 to 0.80, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with the effectiveness of fish of wild origin (Tables B-2a and B-2b in McClure et al. 2000). In 2002, the fish count at Lower Granite Dam was 75,025, more than double the 10-year average. Estimated hatchery chinook at Lower Granite Dam accounted for a minimum of 69.7 percent of the run. The spring chinook count in the Snake River was at the all-time low of about 1,500 as recently as 1995, but in 2001 and 2002, both hatchery and wild/natural returns to the Snake River increased (FPC 2003).

3.3 SOCKEYE SALMON (*ONCORHYNCHUS NERKA*)

3.3.1 Geographic Boundaries and Spatial Distribution

The only remaining anadromous sockeye in the Snake River system are found in Redfish Lake, on the Salmon River. The nonanadromous form (kokanee), found in Redfish Lake and elsewhere in the Snake River Basin, is included in the ESU. Snake River sockeye were historically abundant in several lake systems of Idaho and Oregon. However, all populations have been extirpated in the past century, except fish returning to Redfish Lake.

The most abundant North American sockeye salmon stocks occur in the Bristol Bay region of western Alaska. Recoveries of high-seas tagged sockeye salmon in North America show them to be broadly distributed across the North Pacific Ocean and Bering Sea. There are many fewer recoveries for immature than for maturing North American sockeye salmon, and the known range of maturing fish extends further to the southwest than that of immature fish. The known range of Bristol Bay sockeye salmon is much broader (particularly in the Bering Sea) than that of more southerly stocks (HSSRP 2004). Limited information is available describing the distribution of Snake River sockeye salmon in the marine waters. It appears that there is considerable overlap in the migratory distribution of sockeye salmon originating in rivers of the northeastern Pacific Ocean from the Columbia River to the Alaska Peninsula (Burgner 1991; McNeil and Himshworth 1990). While their ranges overlap, British Columbia-Washington stocks tend to be distributed farther to the south than Alaskan sockeye stocks with the northernmost extension to the general area south and east of Kodiak Island (Burgner 1991).

3.3.2 Critical Habitat

The critical habitat for the Snake River sockeye salmon was designated on December 28, 1993 (NMFS 1993a). The designated habitat consists of river reaches of the Columbia, Snake, and Salmon Rivers, Alturas Lake Creek, Valley Creek, and Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks).

3.3.3 Life History

Snake River sockeye salmon enter the Columbia River primarily during June and July. Arrival at Redfish Lake peaks in August and spawning occurs primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge in April through May, and move immediately into the lake where juveniles feed on plankton for 1 to 3 years before migrating to the ocean. Migrants leave Redfish Lake from late April through May (Bjornn et al. 1968), migrating almost 900 miles to the Pacific Ocean. Out-migrating juveniles pass Lower Granite Dam (the first dam on the Snake River downstream from the Salmon River) from late April to July, with peak passage from May to late June. Once in the ocean, the smolts remain nearshore or within the Columbia River influence during the early summer months. Later, they migrate through the northeast Pacific Ocean (Gustafson et al. 1997; Hart 1973). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to the Snake River in their fourth or fifth year of life.

3.3.4 Population Trends and Risks

Snake River sockeye salmon returns to Redfish Lake since at least 1985, when the Idaho Department of Fish and Game began operating a temporary weir below the lake, have been extremely small (1 to 29 adults counted per year). Snake River sockeye salmon have a very limited distribution relative to critical spawning and rearing habitat. Redfish Lake represents only one of the five Stanley Basin lakes historically occupied by Snake River sockeye salmon. NMFS proposed an interim recovery level of 2,000 adult Snake River sockeye salmon in Redfish Lake and two other lakes in the Snake River Basin (NMFS 1995A). Because only 16 wild and 264 hatchery-produced adult sockeye returned to the Stanley River Basin between 1990 and 2000, NMFS considers the risk of extinction of this ESU to be very high. In 2002, 52 adult sockeye were counted at Lower Granite Dam (FPC 2003). As of September 23, 2003, 12 sockeye salmon have been counted at Lower Granite Dam on the Snake River (USACE 2003).

Historically, the largest numbers of Snake River sockeye salmon returned to headwaters of the Payette River, where 75,000 were taken one year by a single fishing operation in Big Payette Lake. During the early 1880s, returns of Snake River sockeye salmon to the headwaters of the Grande Ronde river in Oregon (Walleye Lake) were estimated between 24,000 and 30,000 at a minimum (Cramer 1990). During the 1950s and 1960s, adult returns to Redfish Lake numbered more than 4,000 fish.

3.4 SHORT-TAILED ALBATROSS (*PHOEBASTRAI ALBATRUS)*

The short-tailed albatross was listed as endangered under the ESA in U.S. waters on July 31, 2000.

3.4.1 Geographic Range and Distribution

The short-tailed albatross once ranged throughout most of the North Pacific Ocean and Bering Sea with known nesting colonies on several islands within the territorial waters of Japan and Taiwan. Other undocumented nesting colonies may also have existed in areas under U.S. jurisdiction on Midway Atoll and in the Aleutian Islands; however, the evidence for breeding on the Alaskan Aleutian Islands is based on scant evidence and is considered highly unlikely (USFWS 2000a).

Breeding colonies of the short-tailed albatross are currently known on two islands in the western North Pacific and East China Sea. The marine range within U.S. territorial waters includes Alaska’s coastal shelf break areas and the marine waters of Hawaii for foraging. The extent to which the birds use open ocean areas of the Gulf of Alaska, North Pacific Ocean, and Bering Sea is unknown (USFWS 2000a). Observations by the USFWS (Terry Antrobus, Anchorage, personal communication cited in USFWS 2000a) suggest that short-tailed albatross frequent nearshore and coastal waters, with “many” birds being sighted within 10 km (6 mi) of shore, and fewer birds (“several”) observed within 5 km (3 mi) of shore. However, sighting data do not indicate that either the Cook Inlet or Shelikof Strait are part of the typical range of this species (MMS 2003).

3.4.2 Critical Habitat

No critical habitat has been designated for short-tailed albatross. The USFWS has determined that the designation of critical habitat for this species is not prudent because it would “not be beneficial to the species” (65 FR 46643, July 31, 2000). USFWS concluded that designation of critical habitat for potential and actual breeding areas within United States’ areas of jurisdiction on the Midway Atoll National Wildlife Refuge would be not provide additional benefit or protection over that conferred through the jeopardy standard of Section 7 of the ESA. With regard to the designation of critical habitat for foraging in the waters of United States, USFWS concluded there is no information available to support a conclusion that any specific marine habitat areas are uniquely important (USFWS 2000a).

3.4.3 Life History

Currently, breeding colonies are limited to the two Japanese Islands of Torishima and Minami-kojima (USFWS 2000a). Birds arrive at the Torishima breeding colony in October and initiate breeding and egg-laying, which continue through late November. The chicks hatch in late December and January and are close to being full grown by late May or early June at which time the adults begin to abandon the breeding colony and return to sea. The chicks fledge after the departure of the breeding adults and depart the colony by mid-July. Non-breeders and failed breeders disperse from the breeding colony in late winter through spring (USFWS 2000a). The specific geographical and seasonal distribution patterns of the birds once they depart from the breeding colony are not well understood. The birds are reported to be long-lived and slow to mature, with an average age at first breeding of 6 years old (USFWS 2000a).

3.4.4 Population Trends and Risks

The total population of short-tailed albatross was estimated to be 1,200 birds in 2000 (USFWS 2000a). Demographic information provided by USFWS (2000a) indicates that the breeding population on the island of Torishima is growing at a “fairly rapid rate,” with an annual population growth rate of 7.8 percent. No information is available for the other breeding colony on the island of Minami-kojima.

The short-tailed albatross population is considered to be at risk due to the following factors (USFWS 2000a):

- The primary breeding colony on Torishima Island is at risk due to the potential for habitat destruction from volcanic eruptions on the island and the destruction of nesting habitat and birds by frequent mud slides and erosion caused by monsoon rains.

- Direct harvest of birds at the breeding colonies in Japan at the beginning of the 20th century dramatically reduced the numbers of birds. Harvesting continued until the early 1930s. By 1949, there were no short-tailed albatross breeding at any of the historically known breeding sites, and the species was thought to be extinct.

- The world population is vulnerable to the effects of disease because of the small population size and extremely limited number of breeding sites.

- Oil spills are considered to pose a potential threat to the species’ conservation and recovery due to damage related to oil contamination, which could cause physiological problems from petroleum toxicity and by interfering with the bird’s ability to thermoregulate. An oil spill in an area where a large number of birds were rafting, such as near breeding colonies, could significantly affect the population

- Consumption of plastics at sea may be a factor affecting the species’ conservation and recovery. Plastics can cause injury or mortality due to internal damage following ingestion, reduction in ingestion volumes, or dehydration.

- Mortality incidental to longline fishing in the North Pacific and Bering Sea. ESA consultations have determined that Alaskan groundfish and halibut fisheries are likely to adversely affect short-tailed albatrosses, but are not likely to result in an appreciable reduction in the likelihood of survival and recovery of the species.

3.5 STELLER’S EIDER (*POLYSTICTA STELLERI*)

The Alaskan breeding populations of Steller’s eider were listed as threatened under the ESA on June 11, 1997. Two breeding populations in Arctic Russia are not part of the ESA listing in the U.S and are not addressed in this section.

3.5.1 Geographic Range and Distribution

The historical breeding range of the Alaska-breeding population of Steller’s eider is unclear; it may have extended discontinuously from the eastern Aleutian Islands to the western and northern Alaska coasts, possibly as far east as the Canadian border (USFWS 2001). In western Alaska, historical (pre-1970) data suggests that the birds formerly nested on the Yukon-Kuskokwim River Delta (Y-K Delta) and at least occasionally at other western Alaska sites, including the Seward Peninsula, St. Lawrence Island, and possibly the eastern Aleutian Islands and Alaska Peninsula (USFWS 2002).

In recent times, breeding has occurred in two general areas outside of the general NPDES permit area. These areas are the Arctic Coastal Plain on the Alaskan North Slope and on the Y-K Delta in western Alaska (USFWS 2001). The Arctic Coastal Plain area, particularly the area surrounding Barrow, is extremely important to nesting Steller's eiders (USFWS 2002). Aerial surveys conducted from 1999-2002 in a 2,757 km^2 area from Barrow south to Meade River recorded between two to over 100 breeding pairs for a maximum density of 0.08 birds per square kilometer. The Y-K Delta is currently of much lesser importance; only seven nests were found on the Y-K Delta from 1994 to 2002 (USFWS 2002).

After breeding, Steller's eiders move to marine waters where they molt and individuals remain flightless for about 3 weeks. The birds, which presumably consist of members of both Alaskan and Russian populations, primarily molt outside of the general NPDES permit area along the north side of the Alaska Peninsula, in Izembek Lagoon, Nelson Lagoon, Port Heiden, and Seal Islands (USFWS 2002). After molting, many Steller's eiders disperse to the Aleutian Islands, the south side of the Alaska Peninsula, Kodiak Island, and as far east as Cook Inlet. Wintering birds usually occur in waters less than 10 m (30 ft) deep and are, therefore, usually found within 400 m (400 yd) of shore except where shallows extend further offshore in bays and lagoons (USFWS 2002).

The winter range from the Kodiak Island east to lower Cook Inlet overlaps the geographical area of the general NPDES permit. Birds from Alaskan and Russian breeding populations intermix on the wintering grounds. It is not known what percent of the wintering birds that overwinter in areas within or near the NPDES permit area are members of the ESA-listed population (Alaskan breeding population) versus the non-ESA-listed Russian breeding population. According to the USFWS, about 4.2 percent of the Steller's eider in or near the Cook Inlet area are assumed to be from the Alaskan breeding population (MMS 2003).

3.5.2 Critical Habitat

The designated critical habitat for the Steller's eider includes five units located along the Bering Sea and north side of the Alaskan Peninsula. These areas are the Delta, Kuskokwim Shoals, Seal Islands, Nelson Lagoon, and Izembek Lagoon (USFWS 2001). Within these areas, the primary habitat components that are essential include areas to fulfill the biological needs of feeding, roosting, molting, and wintering. Important habitats include the vegetated intertidal zone and marine waters up to 9 m (30 ft) and the underlying substrate and benthic community, associated invertebrate fauna, and where present, eelgrass beds and associated biota (USFWS 2001).

No critical habitat is designated within the geographical area of the general NPDES permit for oil and gas exploration, development, and production facilities in Cook Inlet, Alaska.

3.5.3 Life History

Steller's eider nest on tundra adjacent to small ponds or drained basins in locations generally near the coast, but ranging at least as far as 90 km (56 mi) inland (USFWS 2002). Young hatch in late June and feed in wetland habitat on aquatic insects and plants until they are capable of flight in about 40 days. After breeding, Steller's eiders move to marine waters where they molt from late July to late October. After molting most birds disperse to winter in shallow, sheltered waters along the south side of the Alaska Peninsula, Kodiak island, and as far east as Cook Inlet (USFWS 2002). While in marine waters, Steller's eider forage on marine invertebrates such as mollusks and crustaceans.

3.5.4 Population Trends and Risks

Determining the population trends for Steller's eider is difficult (USFWS 2000b). Counts conducted in 1992 indicated that at least 138,000 birds wintered in southwest Alaska; although the proportion belonging to the Alaska-breeding population versus those from Russian-breeding populations is uncertain (USFWS 2002). It does appear that the breeding range in Alaska has substantially contracted, with the species disappearing from much of its historical range in western Alaska (USFWS 2000b). The size of the breeding population on the Alaskan North Slope varies considerably among years, and it is not known whether the population is currently declining, stable, or improving (USFWS 2000b).

The Alaska-breeding population of the Steller's eider is considered to be at risk due to the following factors; destruction or modification of habitat is not thought to have played a major role in the decline of the Steller's eider (USFWS 2002):

- Exposure to lead thought to result primarily from the ingestion of spent lead shot when foraging may pose a significant health risk to Steller's eiders.
- Although there is no information to suggest that disease contributed to the decline of Steller's eiders, recent sampling suggests that Steller's eiders and other sea ducks in Alaska may have significant exposure rates to a virus in the family Adenoviridae (USFWS 2002).
- Changes in predation pressure in breeding areas are hypothesized as the reason for the near disappearance of birds on the Y-K Delta. Recent studies within the primary breeding area on the North Slope near Barrow suggest that nest success is very poor and predation is thought to be the primary factor.
- Although hunting of Steller's eider is prohibited under the Migratory Bird Treaty Act, some intentional or unintentional shooting occurs.
- The Steller's eider Recover Plan (USFWS 2002) suggests that other unidentified factors may also have played a role in the decline of this species. The authors of this plan note that more information is needed to assess the natural or anthropogenic factors that may be affecting this species.

3.6 BLUE WHALE *(BALEAPTERA MUSCULUS)*

The blue whale was listed as endangered under the ESA on June 2, 1970.

3.6.1 Geographic Boundaries and Spatial Distribution

Blue whales are found in all of the world's oceans from the Arctic to the Antarctic. In the North Pacific, they rarely enter the Bering Sea and are only seldom seen as far north as the Chukchi Sea (ADFG 1994a). In the eastern North Pacific, they winter off southern and Baja California; during the spring and summer they are found from central California northward through the Gulf of Alaska. Historical areas of concentration in Alaska include the eastern Gulf of Alaska and the eastern and far western Aleutians (ADFG 1994a).

Blue whales are believed to migrate away from coastlines and feed preferentially in deeper offshore waters (Gregr and Trites 2001; Mizroch et al. 1984). They are seldom seen in nearshore Alaska waters

(ADFG 1994a). These preferences make it highly unlikely that blue whales would frequent Cook Inlet waters within the area of coverage of the general NPDES permit.

3.6.2 Critical Habitat

No critical habitat has been designated for the blue whale.

3.6.3 Life History

Blue whales are estimated to reach sexual maturity between 5 and 10 years of age, and may live as long as 70 to 80 years (Environment Canada 2004b). Upon reaching sexual maturity, females bear a single calf every two to three years (ADFG 1994a). Like many other species of baleen whales, blue whales migrate from low-latitude wintering areas to high-latitude summer feeding grounds.

Blue whales appear to practice more selective behavior in feeding than other rorquals (those baleen whales that posses external throat grooves that expand during gulp-feeding) and specialize in plankton feeding, particularly swarming euphausids (krill) in the Antarctic. In the North Pacific, the species *Euphausia pacifica* and *Thysanoessa spinifera* are the main foods of blue whales (ADFG 1994a).

3.6.4 Population Trends and Risks

The pre-whaling abundance of blue whales in the North Pacific has been estimated at 4,900 to 6,000 animals and is now estimated at 1,200 to 1,700 animals (ADFG 1994a). There have been very few sighting of blue whales in Alaskan waters. The first confirmed blue whale sighting in 30 years was observed by NOAA scientists on July 15, 2004, 100 nautical miles southeast of Prince William Sound (Joling 2004).

The North Pacific blue whale is considered to be at risk due to the following factors:

- Commercial whaling harvested 9,500 blue whales from the North Pacific between 1910 and 1965 (Ohsumi and Wada 1974). Commercial whaling has been prohibited in the United States since 1972 and there has been an International Whaling Commission prohibition on taking blue whales since 1966 (NMFS 2000b).

- Ship strikes have been implicated in the deaths of blue whales in the eastern North Pacific in 1980, 1986, 1987, and 1993. Additional mortality from ship strikes that are unreported is likely (NMFS 2000b).

- The offshore drift gillnet fishery is the only fishery likely to take blue whales in the eastern North Pacific. Approximately 2,000 whales were taken off the west coast of North America between 1910 and 1965 (NMFS 2000b).

3.7 FIN WHALE *(BALAENOPTERA PHYSALUS)*

The fin whale was listed as endangered under the ESA on June 2, 1970.

3.7.1 Geographic Boundaries and Distribution

In the North Pacific Ocean, fin whales can be found from above the Arctic Circle to lower latitudes of approximately 20ºN (Leatherwood et al. 1982). Fin whales along the Pacific coast of North America have been reported during the summer months from the Bering Sea to as far south as central Baja

California; three stocks are recognized: Alaska (Northeast Pacific), California/Washington/Oregon, and Hawaii (Angliss and Lodge 2003; NMFS 2003b).

Fin whales are believed to feed preferentially mainly in offshore waters, with preferred habitat encompassing a large area that includes the continental shelf break and offshore waters (Gregr and Trites 2001). They are rarely seen in inshore coastal waters. Fin whales regularly inhabit areas near NPDES permit coverage including Shelikof Strait, bays along Kodiak Island (especially Uganik and Uyak bays on the west side), and the Gulf of Alaska. Some or all of these areas are feeding areas for fin whale. Sighting data suggest that the distribution and abundance of fin whales in these areas vary seasonally, but there is documented use in the vicinity of Kodiak Island every month of the year except December and January (MMS 2003).

3.7.2 Critical Habitat

No critical habitat has been designated for the fin whale.

3.7.3 Life History

Fin whales tend to be more social than other rorquals, gathering in pods of 2–7 whales or more. Sexual maturity occurs at ages of 6–10 years in males and 7–12 years in females, and they may live as long as 90 years of age (OBIS 2005). Reproductive activity occurs in winter when whales have migrated to warmer waters. Females can mate every 2 to 3 years.

Fin whales eat a variety of fish and zooplankton species including capelin, sandlance, herring, and euphausids (krill) (OBIS 2005).

3.7.4 Population Trends and Risks

The pre-whaling abundance of fin whales in the North Pacific has been estimated at 42,000 to 45,000 animals; estimates in the early 1970's range from 14,620 to 18,630 whales (Ohsumi and Wada 1974). There have been very few sightings of fin whales in Alaskan waters. A survey conducted in August 1994 covering 2,050 nautical miles of track line south of the Aleutian Islands encountered only four fin whale groups (NMFS 2003b).

The Northeast Pacific fin whale is considered to be at risk due to the following factors:

- Commercial whaling harvested 46,032 fin whales throughout the North Pacific between 1946 and 1975 (NMFS 2003b). In the North Pacific and Bering Sea, catches of fin whales ranged from 1,000 to 1,500 animals per year from the mid-1950s to mid 1960s. Commercial whaling has been prohibited in the United States since 1972 and there has been an International Whaling Commission prohibition on taking fin whales since 1976 (NMFS 2003b).

- A ship strike has been implicated in the death of a single fin whale in Uyak Bay, Alaska in 2000 (NMFS 2003b). Additional mortality from ship strikes that are unreported may occur.

- Prior to 1999, there were no observed or reported mortalities of fin whales incidental to commercial fishing operations within the range of the Northeast Pacific stock. However, in 1999, one fin whale was killed incidental to the Bering Sea/Aleutian Island groundfish trawl fishery (NMFS 2003b).

3.8 HUMPBACK WHALE *(MEGAPTERA NOVAEANGLIAE)*

The humpback whale was listed as endangered under the ESA on June 2, 1970.

3.8.1 Geographic Boundaries and Distribution

The humpback whale is distributed worldwide in all ocean basins, although it is less common in Arctic waters. Currently there are four recognized stocks of humpback whales in U.S. waters based on geographically distinct winter ranges (NMFS 2005b): Gulf of Maine stock, eastern North Pacific stock, central North Pacific stock, and the western North Pacific stock. The central North Pacific stock includes animals found in Alaskan waters. In Alaskan waters, most humpbacks tend to concentrate in southeast Alaska, Prince William Sound, the area near Kodiak and Barren Islands, the area between the Semidi and Shumagin Islands, eastern Aleutian Islands, and the southern Bering Sea (ADFG 1994b). In inside waters off southeastern Alaska (i.e., Glacier Bay and Frederick Sound) photo-identification studies summarized by Perry et al. (1999) appear to show that humpback whales use discrete, geographically isolated feeding areas that individual whales return to year after year. These studies find little documented exchange in individual animals between Prince William Sound areas and the Kodiak Island area and between the Kodiak Island area and southeast Alaska feeding areas, suggesting that while movement among these areas may occur, it is reasonably uncommon.

Although humpback whales can be observed year-round in Alaska, most animals migrate during the fall to temperate or tropical wintering areas where they breed and calve. Most whales that spend the summer in Alaskan waters are thought to migrate to winter in waters near Hawaii (ADFG 1994b; Perry et al. 1999). In the summer, humpback whales regularly are present and feeding in areas near and within the Cook Inlet lease-sale area, including Shelikof Strait, bays of Kodiak Island, and the Barren Islands, in addition to the Gulf of Alaska adjacent to the southeast side of Kodiak Island (especially Albatross Banks), the south sides of the Kenai and Alaska peninsulas, and south of the Aleutian Islands. There is some evidence of a discrete feeding aggregation of humpbacks in the Kodiak Island region. Humpbacks also may be present in some of these areas throughout the autumn. Within the proposed lease-sale area, large numbers of humpbacks have been observed in late spring and early summer feeding near the Barren Islands. Humpbacks have also been observed feeding near the Kenai Peninsula north and east of Elizabeth Island (MMS 2003).

Humpback whales feed preferentially over continental shelf waters (Gregr and Trites 2001) and are often observed relatively close to shore, including major coastal embayments and channels (NMFS 2005b).

3.8.2 Critical Habitat

No critical habitat has been designated for the humpback whale anywhere throughout their range.

3.8.3 Life History

Humpback whales are seasonal migrants. The whales mate and give birth while in wintering areas outside of Alaskan waters. Sexual maturity occurs at age 4-6 years, with mature females giving birth every 2–3 years (ADFG 1994b). During spring, the whales migrate back to feeding areas in Alaskan waters, where they spend the summer (ADFG 1994b; Perry et al. 1999).

Humpback whales use a variety of feeding behaviors to catch food including underwater exhalation of columns of bubbles that concentrate prey, feeding in formation, herding of prey, and lunge feeding (ADFG 1994b). Based on their diet, humpbacks have been classified as generalists (Perry et al. 1999).

They have been known to prey upon euphausids (krill), copepods, juvenile salmonids (*Oncorhynchus spp.*), Arctic cod (*Boreogadus saida*), capelin (*Mallotus villosus*), Pacific herring (*Clupea harengus pallasi*), sand lance (*Ammodytes hexapterus*), walleye pollock (*Theragra chalcogramma*), pollock (*Pollachius virens*), pteropods, and some cephalopods. On Alaska feeding grounds, humpback whales feed primarily on capelin, juvenile walleye pollock, sand lance, Pacific herring, and krill (NMFS 2003c; Perry et al. 1999).

3.8.4 Population Trends and Risks

The pre-whaling abundance of humpback whales in the North Pacific has been estimated to be approximately 15,000 animals (ADFG 1994b). The current total estimated abundance of the Central North Pacific stock of humpback whales is 4,005 individuals (NMFS 2005b). NMFS (2005b) reports abundance within known feeding areas in Alaska as: southeast Alaska (961 whales), Kodiak Island area (651 whales), and Prince William Sound (149 whales). At least some portions of this stock have increased in abundance between the early 1800s and 2000. The rate of population increase in southeast Alaska may have recently declined, which may indicate the stock is approaching its carrying capacity (NMFS 2005b).

The Central North Pacific humpback whale is considered to be at risk due to the following factors:

- Commercial whaling harvested more than 28,000 animals from the North Pacific during the 20th century and may have reduced this population to as few as 1,000 individuals after the 1965 hunting season (NMFS 2005b).

- Direct ship strikes are a significant source of mortality in the eastern North Pacific stock of humpback whales in California, Oregon, and Washington waters, where there is an average of 0.6 whales killed per year (Perry et al. 1999). Little information is available on mortality rates from ship strikes for humpback whale in Alaskan waters. One pregnant humpback whale was reported killed by a cruise ship in Glacier Bay in July 2001 (Richardson 2003).

- Prior to 1990, there were thought to be little mortality in U.S. waters due to commercial fishing operations. Perry et al. (1999) reported that NMFS observers had reported no mortalities from the Bering Sea, Aleutian Islands, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. Data accumulated through 1995 from Hawaii and southeastern Alaska areas were used to calculate an estimated minimum mortality incidental to commercial fishing operations of 0.8 whales per year (Perry et al. 1999).

- Humpbacks exhibit variable responses to noise, and the level and type of response exhibited by whales has been correlated to group size, composition, and apparent behaviors at the time of possible disturbance. Humpback whales have suffered severe mechanical damage to their ears from noise pulses from underwater blasting; whales exposed to playbacks of noise from drillships, semisubmersibles, drilling platforms, and production platforms do not exhibit avoidance behaviors at noise levels up to 116 db (Malme et al. 1985).

3.9 NORTH PACIFIC RIGHT WHALE *(EUBALAENA JAPONICA)*

The Northern Right whale (*Balaena glacialis*) was listed as endangered under the ESA on June2, 1970. On April 10, 2003, the NMFS published a final rule (NMFS 2003a) that split the endangered northern right whale into two endangered species: North Atlantic right whale (*Eubalaena glacialis*) and North Pacific right whale (*Eubalaena japonica*). This section discusses the North Pacific right whale.

3.9.1 Geographic Boundaries and Distribution

The North Pacific stock of northern right whale has historically occurred across the North Pacific, north of 35ºN latitude, with concentrations of whales occurring in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and the Sea of Japan (NMFS 2001).

Two populations of North Pacific right whale are thought to exist, one in the western North Pacific off Russia and the other in the eastern North Pacific off Alaska (MMC 2002). The distribution and status of neither population is well understood. The eastern population is more severely depleted than western population, with the population thought to number in the tens of individuals versus hundreds for the western population (MMC 2002; NMFS 2005a). Between 1900 and 1994, there have been only 29 reliable sightings of right whales in the eastern North Pacific. Since that time between 4 and 13 individuals have been sighted each year; all these sightings have occurred in a 60 by 100 nautical mile area about 200 nautical miles north of Unimak Pass in the southeastern Bering Sea (CBD 2000; MMC 2002; NMFS 2002a).

Because the North Pacific eastern population is so small and infrequently sighted, little is known about their range and movements. The whales are thought to move northward to high latitudes in the spring, summer in the Bering Sea and Gulf of Alaska, and move southward in the fall and winter possibly as far south as Baja, California (CBD 2000; NMFS 2002a).

Historically, right whales often were observed in coastal waters where their slow speed and tendency to float after death resulted in their near-decimation by whalers in the 1800s. Recent whale sightings have all occurred within the shallower waters of the continental shelf (CBD 2000). No information currently exists regarding the presence of this species in Cook Inlet, Alaska.

3.9.2 Critical Habitat

On June 3, 1994, the NMFS designated critical habitat for the species of northern right whale (NMFS 1994a), which as of April 10, 2003, became referred to as the North Atlantic right whale (NMFS 2003a). The three areas designated as critical habitat are in the North Atlantic Ocean off the eastern United States. NMFS determined at that time that insufficient information was available to consider critical habitat designation for other stocks of northern right whale, including whales residing in the North Pacific.

On October 4, 2000, the Center for Biological Diversity petitioned the NMFS to designate a portion of the southeastern Bering Sea as critical habitat for the North Pacific right whale on the basis of annual sightings of whales in the area that suggests the area is a summer feeding ground for this severely depleted population (CBD 2000). On July 11, 2001, the Marine Mammal Commission responded to this request by recommending that NMFS proceed with designating the area as critical habitat and modify the boundaries as future data on population distribution becomes available (MMC 2002). However, on February 20, 2002, NMFS published notice that the Service had determined that the petitioned action to designate critical habitat was not warranted at this time (NMFS 2002b) noting that because the essential biological requirements of the population in the North Pacific Ocean are not sufficiently understood, the extent of critical habitat cannot be determined. Currently, no critical habitat has been designated for the North Pacific right whale.

3.9.3 Life History

As noted in Section 3.9.1, little is known about the movements of the eastern population of North Pacific right whale; although some authors believe they may move seasonally from areas in the Bering Sea and

Gulf of Alaska southward possibly as far as the waters off Baja, California (CBD 2000; NMFS 2002a). No sightings of a cow with a calf have been confirmed since 1900 (NMFS 2002b).

Among baleen whales, right whales appear to have the most specialized feeding strategy. Studies conducted in the North Atlantic suggest that right whales require high densities of copepods concentrated in surface waters for effective feeding; the feeding requirements of an adult whale are estimated to be at least 4.07×10^5 Kcal/day (CBD 2000). The feeding preferences of North Pacific right whales have not been determined; however, the NMFS has noted that these whales probably feed almost exclusively on calanoid copepods, a component of the zooplankton (NMFS 2002b).

3.9.4 Population Trends and Risks

The pre-exploitation size of the population on North Pacific right whales has been estimated as likely exceeding 10,000 animals (67 FR 7660, February 20. 2002) to 19,000 animals (CBD 2000). The current population is thought to be very small, perhaps in the tens of animals (NMFS 2002b).

The North Pacific right whale is considered to be at risk due to the following factors:

- Whaling records indicate that during the 19th century, pelagic whalers harvested over 15,000 North Pacific right whales. As early as the 1870s, the whale was noted as being rare (CBD 2000).

- Right whales are slow-swimming and spend much of their time near the surface of the water, which makes them susceptible to ship strikes. Although vessel-related mortality rates for the North Pacific are not known, the NMFS is considering regulations to implement a strategy to reduce mortalities to North Atlantic right whales as a result of vessel collisions (NMFS 2004).

- The magnitude and nature of entanglements in fishing gear are not known. However, an estimated 57 percent of right whales in the North Atlantic bear scars and injuries indicative of fishing gear entanglement (CBD 2000). The extent of fisheries in the southeastern Bering Sea suggests that fishing gear entanglements may pose a risk to North Pacific right whale.

- Disturbance due to anthropogenic noise may affect right whales by changing normal behavior to temporarily or permanently avoid noise sources. Noise may also raise background noise levels and interfere with the detection of sounds from other whales or natural sources. Information on the hearing capacity of right whales is not available; however, some authors have suggested that their hearing abilities are especially acute below 1 kHz (CBD 2000).

3.10 SEI WHALE *(BALAENOPTERA BOREALIS)*

The sei whale was listed as endangered under the ESA on June 2, 1970.

3.10.1 Geographic Boundaries and Distribution

Sei whales have historically occurred in all oceans of the world, migrating from low-latitude wintering areas to high-latitude summer feeding grounds (Fisheries and Oceans Canada 2005). In the eastern North Pacific, sei whales are common in the southwest Bering Sea to the Gulf of Alaska, and offshore in a broad arc between about 40ºN and 55ºN (Environment Canada 2004a; WWF 2005).

The sei whale prefers deeper offshore waters, with preferred habitat tending to occur in offshore areas that encompass the continental shelf break (Gregr and Trites 2001). Commercial whaling catch records off British Columbia indicate that less than 0.5 percent of sei whales were caught in waters over the continental shelf (Environment Canada 2004a). These preferences make it unlikely that sei whales would frequent Cook Inlet waters within the geographic area covered by the general NPDES permit.

3.10.2 Critical Habitat

No critical habitat has been designated for the sei whale.

3.10.3 Life History

Sei whales reach sexual maturity between 5 and 15 years of age, and may live as long as 60 years. Like many other species of baleen whales, sei whales migrate from low-latitude wintering areas to high-latitude summer feeding grounds. Catch records suggest that whale migrations are segregated according to length (age), sex, and reproductive status. Pregnant females appear to lead the migration to feeding grounds, while the youngest animals arrive last and depart first (Environment Canada 2004a). Sei whales feed primarily on copepods, followed by small squid, euphausids, and small pelagic fish (Trites and Heise 2005).

3.10.4 Population Trends and Risks

The pre-whaling abundance of sei whales in the North Pacific has been estimated to range from 42,000-62,000 animals (Ohsumi and Wada 1974; Tillman 1977). There are no current data on trends in sei whale abundance in the eastern North Pacific waters. A fact sheet prepared by NMFS (2000a) on the eastern North Pacific stock of sei whale suggest that the population is expected to have grown since being given protected status under the MMPA in 1976; however, continued unauthorized take, incidental ship strikes, and fill net mortality makes this uncertain.

The eastern North Pacific sei whale is considered to be at risk due to the following factors:

- Commercial whaling harvested 61,500 sei whales from the North Pacific between 1947 and 1987. Commercial whaling has been prohibited in the United States since 1972 and there has been an International Whaling Commission prohibition on taking sei whales since 1976 (NMFS 2000a).

- Ship strikes may occasionally kill sei whales; no strikes have been reported for this species in the eastern North Pacific (NMFS 2000a).

- Environment Canada (2004a) notes there are no species-specific factors limiting the recovery of sei whales. However, indirect threats to which they are exposed include habitat loss and degradation through competition with commercial fisheries, vessel noise and traffic, seismic exploration, chemical contamination, and competition with some species of fish.

3.11 SPERM WHALES *(PHYSETER MACROCEPHALUS)*

The sperm whale was listed as endangered under the ESA on June 2, 1970.

3.11.1 Geographic Boundaries and Distribution

Sperm whales inhabit all ocean basins, from equatorial to polar waters. Their distribution generally varies by gender and the age composition of groups, and is influenced by prey availability and oceanic conditions (Perry et al. 1999). In the North Pacific, sperm whales are distributed widely, with the northernmost boundary extending from Cape Navarin (62ºN) to the Pribilof Islands (Angliss and Lodge 2003). Mature females, calves, and immature whales of both sexes in the North Pacific are found in social groups and remain in tropical and temperate waters year round from the equator to approximately 45ºN latitude (Angliss and Lodges 2003; Perry et al. 1999). Males lead a mostly solitary life after reaching sexual maturity between 9 and 20 years of age and are thought to move north in the summer to feed in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands. Research has revealed considerable east-west movement between Alaska and the western North Pacific (Japan and Bonin Islands), with little evidence of north-south movement in the eastern Pacific (Angliss and Lodge 2003; Perry et al. 1999).

The habitat preferred by sperm whales differs among the sexes and age composition of individual whales. The social groups comprised of females, calves, and immature whales have a broader habitat distribution than males; they are generally restricted to waters with surface temperatures greater than 15ºC and are rarely found in areas with water depths less than 200 to 1,000 m (656 to 3,280 ft) (Gregr and Trites 2001; Reeves and Whitehead 1997). Males exhibit a tighter distribution over deeper waters along the continental shelf break, and are often found near steep drop-offs or other oceanographic features (e.g., offshore banks, submarine trenches and canyons, continental shelf edge), presumably because these areas have higher foraging potential (AKNHP 2005; Gregr and Trites 2001).

The distribution of sperm whale indicates that male sperm whales are the only sex that frequent Alaskan waters. Available evidence indicates that males are present offshore in the Gulf of Alaska during the summer, but they are very unlikely to be present in the permit coverage area in Cook Inlet.

3.11.2 Critical Habitat

No critical habitat has been designated for the sperm whale.

3.11.3 Life History

Sperm whales appear to be organized in a social system that consists of groups of 10–40 adult females plus their calves which remain year-round in tropical and temperate waters. Solitary males join these groups during the breeding season, which takes place in the middle of the summer (NMML 2004a). Males reach sexual maturity at 9-20 years of age (Perry et al. 1999), but do not seem to take an actual part in breeding until their late 20s (ACS 2004). Female sperm whales reach sexual maturity at around 9 years of age and produce a calf approximately once every 5 years (NMFS 2005c).

Sperm whales feed primarily on medium-sized deep water squid, with the remaining portion of their diet comprised of octopus, demersal and mesopelagic sharks, skates, and fish; feeding occurs all year round, usually at depths below 400 feet (ACS 2004; AKNHP 2005; NMFS 2005c; NMML 2004a).

3.11.4 Population Trends and Risks

Pre-whaling abundance estimates of sperm whale in the North Pacific are considered unreliable and range from 472,000 to 1,260,000 animals (Angliss and Lodge 2003; Perry et al. 1999; NMFS 2005c). The abundance of whales in the North Pacific in the late 1970s was estimated to be 930,000 animals (Rice

1989). The current abundance of the North Pacific stock (Alaska) of sperm whale is unknown (NMFS 2005c).

Risk factors for sperm whale in the North Pacific are listed below:

- The population of sperm whales was likely well below pre-whaling levels before modern whaling became intensive in the 1940s (Reeves and Whitehead 1997). Commercial whaling of sperm whales in the North Pacific harvested 258,000 animals between 1947 and 1987 (Angliss and Lodge 2003). In addition to reducing overall numbers of animals, commercial whaling altered the male-to-female ratio by selective killing of the larger breeding age males (AKNHP 2005).

- Incidental mortality arising from commercial fishing operations in the Gulf of Alaska have been documented by NMFS observers and may be increasing in frequency. The average annual mortality rate based on observations from 1997 to 2001 is 0.4 whales per year. Most interactions appear to occur with the longline fishery operating in the Gulf of Alaska waters east of Kodiak Island (AKNHP 2005).

- Sperm whales may be impacted by ship strikes, although their behavior suggest that they are at a lesser risk than other baleen whales that spend a greater proportion of their time in surface waters (NMFS 2005c).

- Sperm whales may be especially sensitive to noise pollution, resulting in changes of behavior and distribution in response to unnatural low-frequency sounds (Reeves and Whitehead 1997; Perry et al. 1999).

- Chemical contaminants that bioaccumulate in higher trophic level predators such as sperm whale may be a concern. Relatively high levels of mercury have been measured in breeding females captured off Australia (Perry et al. 1999).

3.12 STELLER SEA LIONS (*EUMETOPIAS JUBATUS)*

The NMFS listed Steller sea lion as threatened, by emergency interim rule, on April 5, 1990 (NMFS 1990a). The emergency rule listing, which had duration of 240 days, was followed by a final listing of Steller sea lion as threatened on November 26, 1990 (NMFS 1990b). On May 5, 1997, the NMFS issued a final rule that reclassified Steller sea lions into two distinct population segments (NMFS 1997). The Steller sea lion population west of 144ºW longitude (a line intersecting the Alaskan coastline near Cape Suckling) was reclassified as endangered; the sea lion population to the east of this line retained its ESA-listing status as threatened.

3.12.1 Geographic Boundaries and Distribution

The Steller sea lion is distributed around the North Pacific Ocean rim from northern Hokka, Japan along the western North Pacific northward through the Kuril Islands and Okhotsk Sea, then eastward through the Aleutian Islands and central Bering Sea, and southward along the eastern North Pacific to the Channel Islands, California (NMML 2004b). Two distinct populations (western and eastern) are thought to occur within this range, with the dividing line being designated as 144ºW longitude (NMFS 1997).

There is designated critical habitat for Steller sea lion and other habitat considered as critical habitat by the NMFS within the lease-sale area: at Cape Douglas, the Barren Islands, and marine areas adjacent to the southwestern Kenai Peninsula, and at the extreme southern end of Cook Inlet. There is additional critical habitat—including rookeries, haulouts, and marine foraging areas for the western population stock—in areas near the proposed lease-sale area, including Shelikof Strait, and areas along the southern side of the Alaska Peninsula (MMS 2003).

3.12.2 Critical Habitat

In 1993, NMFS issued a final rule designating critical habitat for the Steller sea lion, including all U.S. rookeries, major haulouts in Alaska, horizontal and vertical buffer zones (5.5 km) around these rookeries and haulouts, and three aquatic foraging areas in north Pacific waters: Sequam Pass, southeastern Bering Sea shelf, and Shelikof Strait (NMFS 1993b). This final rule was amended on June 15, 1994 to change the name of one designated haulout site from Ledge Point to Gran Point and to correct the longitude and latitude of 12 haulout sites, including Gran Point (NMFS 1994b).

Critical habitat includes a terrestrial zone that extends 3,000 ft (0.9 km) landward from the baseline or base point of each major rookery and major haulout in Alaska. Critical habitat includes an air zone that extends 3,000 ft (0.9 km) above the terrestrial zone of each major rookery and haulout area measured vertically from sea level. Critical habitat within the aquatic zone in the area east of 144ºW longitude (ESA threatened population) extends 3,000 ft (0.9 km) seaward in state and federally managed waters from the base point of each rookery or major haulout area. Critical habitat within the aquatic zone in the area west of 144ºW longitude (ESA endangered population) extends 20 nautical miles (37 km) seaward in state and federally managed waters from the baseline or base point of each rookery or major haulout area (NMFS 1993b).

3.12.3 Life History

The breeding season for Steller sea lions is from May to July, where the animals congregate at rookeries and the males defend territories, mating occurs, and the pups are born. Nonreproductive animals congregate to rest at more than 200 haulout sites where little or no breeding occurs. Bulls become sexually mature between 3 and 8 years of age, but typically are not able to gain sufficient size and successfully defend territory within a rookery until 9–10 years of age. Females reach sexual maturity and mate at 4–6 years of age and typically bear a single pup each year. Sea lions continue to gather at both rookeries and haulout sites throughout the year, outside of the breeding season (NMML 2004b). Habitat types that typically serve as rookeries or haulouts include rock shelves, ledges, slopes, and boulder, cobble, gravel, and sand beaches. Seasonal movements occur generally from exposed areas in summer to protected areas in winter (ADFG 1994c).

When foraging in marine habitats, Steller sea lions typically occupy surface and mid-water ranges in coastal regions. They are opportunistic predators and feed on a variety of fish (walleye Pollock, Atka mackerel (*Pleurogrammus monopteryguius*), Pacific herring, capelin, sand lance, Pacific cod (*Gadus macrocephalus*), and salmon), and invertebrates (squid, octopus) (ADFG 1994c; NMML 2004b).

3.12.4 Population Trends and Risks

In 1980, the world population of Steller sea lion was estimated to be between 245,000 and 290,000 (Loughlin et al. 1992). The western population of Steller sea lion has declined at about 5.0 percent per year over the period of 1991–2000, while the eastern population has increased at about 1.7 percent per year (Loughlin and York 2000). Based on recent survey data collected in 2003–2004, Fritz and Stinchcomb (2005) suggest that the decline of the western population within Alaskan territory may have abated in recent years, with an annual rate of increase estimated at 2.4 to 4.2 percent.

A substantial amount of research has been devoted to trying to determine the cause(s) of the Steller sea lion decline, whose number has dropped by more than 80 percent in the last three decades in Alaskan waters (National Academies 2002). Currently, there is no consensus on a single causal factor, and it is likely that many factors could have contributed to the decline of this species (NMML 2004b). The hypotheses can be divided into two categories (National Academies 2002); those that propose factors that would affect the overall health and fitness of sea lions and those that propose factors that would directly kill sea lions regardless of their general health. The first four items listed below fall into the former category; the last five items fall within the latter category:

- Reduced prey availability or prey quality due to large-scale fishing operations
- Climate changes in the 1970s that may have affected the availability of quality of prey
- Non-fatal diseases that inhibit sea lions' ability to forage for food
- Impairment (reduced fecundity) caused by the consumption of contaminated prey
- Predation by killer whales
- Incidental mortality caused by fishing operations
- Illegal harvest
- Subsistence harvesting
- Fatal diseases caused by contagious pathogens or increased exposure to pollutants

While there may not be consensus on a single causative factor for the decline of sea lion abundance in Alaskan waters, nutritional stress is probably the leading hypothesis (NMFS 1995B; Porter 1997). Sea lion declines in abundance have coincided with the declines of other Alaskan pinniped stocks (harbor seal and northern fur seal) and some sea bird breeding colonies. Over the same period of these declines, there has been a rapid growth in groundfish fisheries in Alaska, which suggests that competition by fisheries and reduced prey availability may be limiting the growth and reducing the fitness of sea lions (Porter 1997). Pollock make up over 50 percent of the prey consumed by sea lions; the removal of large quantities of Pollock, and other groundfish that could provide alternative prey, by commercial fisheries may have caused increased nutritional stress and reduced the fitness of sea lions resulting in increased mortality rates.

3.13 NORTHERN SEA OTTER (*ENHYDRA LUTRIS KENYONI)*

The USFWS issued a final rule listing the southwest Alaska distinct population segment of the northern sea otter as threatened under the ESA on August 9, 2005 (USFWS 2005).

3.13.1 Geographic Boundaries and Distribution

The overall range of the sea otter extends from northern Japan to southern California. There are three recognized subspecies of *Enhydra lutris*. *E. lutris kenyoni*, referred to as the northern sea otter, has a range that extends from the Aleutian Islands in southwestern Alaska to the coast of the state of Washington (USFWS 2005).

Sea otters generally occur in shallow water areas near the shoreline where they forage in shallow water. Visual observation of 1,251 dives by sea otters in southeast Alaska, indicates that foraging activities typically occurs in water depths ranging from 2 to 30 m (7 to 98 ft), although foraging at depths up to 100 m (328 ft) was observed (Bodkin et al. 2004).

Sea otter movements are influenced by local climatic conditions such as storm events, prevailing winds, and in some areas, tidal conditions. They tend to move to protected or sheltered waters during storm events of high winds (USFWS 2005). The animals usually do not migrate and seldom travel unless an area has become overpopulated and food is scarce (ADFG 1994d).

The home ranges of sea otters in established populations are relatively small. Sexually mature females have home ranges of 8–16 km (5–10 miles). Breeding males remain for all or part of the year within the bounds of their territory, which constitutes a length of coastline from 100 m (328 ft) to 1 km (.6 mile). Male sea otters that do not hold territories may move greater distances between resting and foraging areas than territorial males (USFWS 2005).

3.14.2 Critical Habitat

No critical habitat has been designated for the northern sea otter.

3.13.3 Life History

Sea otters mate at all times of the year, and young may be born in any season; however, in Alaska, most pups are born in late spring (ADFG 1994d). Females typically give birth in the water, although they have been observed giving birth on shore (USFWS 2005). Male sea otters appear to reach sexual maturity at 5–6 years of age, and have a lifespan of about 10–15 years. Female sea otters reach sexual maturity at 3–4 years of age and have a lifespan of about 15–20 years (USFWS 2005). Sea otters are gregarious and may become concentrated in an area, sometimes resting in pods of fewer than 10 to more than 1,000 animals (ADFG 1994d).

The search for food is one of the most important daily activities of sea otters, as large amounts are required to sustain the animal in healthy condition. Sea urchins, crabs, clams, mussels, octopus, other marine invertebrates, and fishes make up the normal diet of sea otters (ADFG 1994d).

3.13.4 Population Trends and Risks

Prior to commercial exploitation, the world population of sea otter in the North Pacific ocean was estimated to be between 150,000 and 300,000 individuals (USFWS 2005). Over the 170 years of commercial exploitation, sea otters were hunted to the brink of extinction first by Russian and later by American fur hunters. Sea otters became protected under the International Fur Seal Treaty of 1911; at that time the entire population may have been reduced to 1,000–2,000 animals (USFWS 2005).

By the 1980s, sea otters in southwest Alaska had increased in abundance and re-colonized much of their former range. The population in southwest Alaska is currently estimated at 41,865 animals (USFWS 2005); 15 percent (6,284 animals) of this total occur within the Kodiak Archipelago, which lies near the geographic area of the general NPDES permit.

3.14 BELUGA WHALE (DELPHINAPTERUS LEUCAS)

Beluga whales are one of the two members of the family Monodontidae and are divided into five stocks on the basis of mitochondrial DNA analyses: Cook Inlet, Bristol Bay, eastern Bearing Sea, eastern Chukchi Sea, and Beaufort Sea (NMFS 2003). The Cook Inlet stock of beluga whales was placed on the ESA candidate list in 1991 (NMFS 1991). The stock was more recently determined to be depleted under the Marine Mammal Protection Act (NMFS 2000c).

3.14.1 Geographic Boundaries and Distribution

Beluga whales occur in arctic waters of the northern hemisphere, living in openings within the pack ice in winter and migrating to shallow bays and estuaries in summer. Beluga whales in U.S. waters range from Yakutat to the Beaufort Sea. Some beluga stocks migrate over thousands of miles for example, moving from the Bering Sea to the Mackenzie River estuary in Canada (ADFG 1994e). The winter distribution of the Cook Inlet stock is unknown, but few beluga whales have been observed in the Gulf of Alaska outside the inlet and sightings. Tagging data indicate that at least a portion of the Cook Inlet stock remains in the inlet throughout the year (NMFS 2002c; NMFS 2005d). In spring, Cook Inlet beluga whales move toward the upper portions of the inlet (NMFS 2005). Large groups may remain in and near the Susitna River, Little Susitna River, and the Turnigan Arm. Beluga whales are known to move up rivers including those feeding Cook Inlet; individuals from northern stocks have been observed in the Yukon River as far upstream as Tanana, Rampart, and Fort Yukon (ADFG 1994e).

3.14.2 Critical Habitat

Critical habitat is not applicable to this species because it is not designated under the ESA.

3.14.3 Life History

Beluga whales are small with adult males generally ranging in size from 11 to15 feet and females reaching 12 feet. Calves are born dark gray to brownish-gray with the color lightening to a yellow-white in adulthood. Reports of sexual maturity at range from 4 to 15 years with males taking longer than females (NMFS 2002c). Calves are born in late spring and early summer, usually in the summer concentration areas following a 14-month gestation period (ADFG 1994e). Adult females typically produce offspring once every 3 years. Members of the Cook Inlet stock have been observed calving in the Kachemak Bay, off the mouths of the Beluga and Susitna Rivers, and in the Turnagin arm (NMFS 2002c).

Belugas are social and are frequently observed in groups ranging in size from two to five to pods of more than 100 individuals. They are known to vocalize using grunts, clicks, chirps, and whistles to navgate, find prey and communicate. During summer months, they are often found in shallow waters and feed on schooling and anadromous fish including herring, capelin, eulachon, salmon and sculpins (ADFG 1994e). They are also known to eat octopus, squid, crabs, shrimp clams, mussels and sandworms; belugas appear to have greater feeding success in areas with dense concentrations of prey (NMFS 2002c).

3.14.4 Population Trends and Risks

NMFS stock assessment reports estimate the combined population of the five beluga whale stocks in U.S. waters at nearly 60,000 individuals (NMFS 2005d). NMFS reports that the population trends for the Beaufort Sea and Eastern Bering Sea stocks are unknown; these two stocks account for over 90 percent of the estimated population of beluga whales in U.S. waters (NMFS 2005d). The population of the Eastern Chukchi stock consisting of 3,710 individuals shows no evidence of decline and NMFS considers the population of the Bristol Bay stock (1,619) to be stable to increasing (NMFS 2005d). On the basis of the range of numbers reported, NMFS estimates that the population in the mid-1980s was between 1,000 to 1,300 individuals. Population trend analyses conducted on the Cook Inlet stock between June 1994 and June 1998 were constrained by the limited data available but showed a high probability that a 40 percent decline in the population had occurred during the time period (NMFS 2000d; NMFS 2005d).

NMFS included the Cook Inlet stock beluga whale stock on the candidate list of threatened and endangered species in 1991 (NMFS 1991). No further action was taken immediately following, although

NMFS received two petitions in 1999 to list the Cook Inlet stock under the ESA (NMFS 2000c) resulting in the Cook Inlet stock being designated as depleted under the MMPA (NMFS 2000d). Subsequent investigations assessed natural and human-induced sources of potential impacts that included:

- Habitat capacity and environmental change
- Strandings events
- Predation
- Subsistence harvest
- Commercial fishing
- Oil and gas development

The investigations concluded that subsistence harvests presented the most immediate threat to the stock. Although NMFS found that other potential sources of impact could have some negative effect on recovery, none were considered significant (NMFS 2000c). Population surveys since the imposition of mandatory and voluntary restrictions on subsistence harvests in 1999 show no clear trend and no indication that the population is increasing (NMFS 2005e). As a result, NMFS developed the *Draft Conservation Plan for the Cook Inlet Beluga Whale (Delphinapterus leucas)* in 2005 to establish goals and objectives that can be achieved cooperatively to promote the recovery of the Cook Inlet beluga whale population. The goals and objectives apply to a range of potential sources of impacts including those identified above as well as shoreline development, vessel traffic, and noise.

4.0 ENVIRONMENTAL BASELINE

The purpose of this section is to identify "the past and present effects of all federal, state, or private activities in the action area, the anticipated effects of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the effect of state or private actions that are contemporaneous with the consultation process" (50 CFR 402.02, definition of "effects of the action"). These factors affect the species' environment or critical habitat in the action area. The factors are described in relation to species' biological requirements in the action area.

Over the last 20 years, the MMS has consulted with the USFWS and NMFS on previous lease sales for oil and gas exploration, development, and production within the coverage of the proposed NPDES permit and surrounding areas. The most recent consultation occurred in conjunction with lease sales 191 and 199. In their 1993 Cook Inlet lease sale 149 biological opinion, the NMFS concluded that lease sale and associated oil and gas activities would not be likely to jeopardize the continued existence of Steller sea lions, gray whales, humpback whales, right whales, fin whales, sei whales, sperm whales, blue whales or to result in the destruction or adverse modification of critical habitat for the Steller sea lion (MMS 2003).

MMS also consulted with NMFS and USFWS for the proposed lease sale 88 in 1984. In the biological opinion for this federal action, NMFS concluded that additional impacts from oil and gas activities would be likely to jeopardize the continued existence of northern right whales; however, the agency believed that the Department of Interior could plan activities associated with oil and gas leasing and exploration in the area to avoid impacts to this species (MMS 2003)

Another consultation was conducted in 1980 for the lower Cook Inlet/Shelikof Strait lease sale 60. The biological opinion prepared by NMFS concluded that the lease sale and oil and gas exploration activities were not likely to jeopardize the continued existence of any endangered whale or its habitat (MMS 2003).

4.1 DESCRIPTION OF ACTION AREA

The expired general permit authorized discharges from exploratory oil and gas extraction facilities located in Cook Inlet north of a line extending between Cape Douglas (58° 13' N latitude, 153° 15' W longitude) and Port Chatham (59° 13' N latitude, 151° 47' W longitude) (Figure 1). Development and production facilities were authorized to discharge only in the northern (coastal) portion of this area of coverage. This is the area north of a line extending across the Inlet at the southern edge of Kalgin Island (Figure 1).

The Action Area of coverage for the reissued general permit will include the areas covered by the expired permit (Figure 1) and an additional area to the south in the lower portion of Cook Inlet to the northern edge of Shuyak Island (Figure 2). The expanded area of coverage includes areas under the Minerals Management Service lease sales 191 and 199 and the adjoining state waters (Figure 2).

4.2 BIOLOGICAL REQUIREMENTS IN ACTION AREA

The biological requirements of ESA-listed species can be considered, at a minimum, to be met if the species have access to critical habitat. Critical habitat is defined under Section 3 of the ESA as "the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection." Of the 13 species that were evaluated in this BE, only a single species, Steller sea lion, has critical habitat designated with the action area. One species has designated critical habitat outside of the action area (Steller's eider), while the remaining eight species (short-tailed albatross, northern right whale, sei whale, blue whale, fin whale, humpback whale, sperm whale, and northern) have not had any critical habitat designated by either NMFS or USFWS.

In the absence of designated critical habitat, the biological requirements of the ESA-listed species within the action area would appear to be the maintenance, or enhancement, of habitat conditions, prey availability, and water quality to enable the current use of the action area to be maintained. Current uses within the action area include seasonal or year-round foraging, migration, wintering areas, and reproduction.

4.3 CURRENT STATUS OF THE ENVIRONMENT

The water quality in Cook Inlet is influenced by tidal turbulence and determined by water's chemical and physical characteristics. Naturally occurring and man-made substances enter Cook Inlet waters and are diluted and dispersed by the currents associated with the tides, estuarine circulation, wind-driven waves and currents, and Coriolis force (MMS 2003). On the basis of standard salt balance calculations, 90 percent of waterborne contaminants would be flushed from the inlet in 10 months (MMS 2003). Because tidal turbulence is the major mixing factor in Cook Inlet, rather than seasonally varying fresh water input, this flushing rate is relatively invariant from season to season. However, some of the persistent contaminants can accumulate in the food chain and exceed toxic thresholds, especially in predators near the top of the food chain; they can also accumulate in the seafloor sediments (MMS 2003).

The water quality of lower Cook Inlet generally is good. Cook Inlet is a relatively large tidal estuary with a sizable tidal range. The turbulence associated with mainly tidal currents but also winds results in the vertical mixing of the waters. A relatively large volume of water and a large variety of naturally occurring inorganic and organic substances are transported into Cook Inlet by the streams and rivers and by currents from the Gulf of Alaska; the amounts of the individual substances discharged into the inlet appear to be quite variable. Substances transported into Cook Inlet that remain in suspension or dissolved in the water column are dispersed by tidal currents and winds. In addition, there are a variety of man-made substances routinely discharged into Cook Inlet. The major discharges are from municipalities bordering Cook Inlet, the oil and gas industry, and seafood processors. The quantities of man-made substances discharged into Cook Inlet generally are less than discharged by the streams and rivers. For some of the manmade substances, the amounts discharged may be within the range associated with the natural variability of stream and river discharges. In addition to the routine discharges, there have been a number of accidental spills of a variety of substances, including crude oil and refined petroleum products. Hydrocarbons are found throughout the marine environment, but generally the concentrations are low and of biogenic origin—mainly derived from terrestrial plants. The low concentrations of hydrocarbons in Cook Inlet are similar to concentrations found in other unpolluted coastal areas. The amount of total organic carbon in the sediments, where contaminants could accumulate, is low and indicates an environment that generally is uncontaminated (MMS 2003).

4.3.1 Oxygen, Phosphate, Nitrate, Nitrite, Ammonia, and Silicate in the Water Column

The concentration of oxygen in the surface waters of Cook Inlet ranges from about 7.6 milliliters per liter in the northern part to 10 milliliters per liter in the southwestern part; none of the waters in the inlet are oxygen-deficient (MMS 2003). Other chemical parameters (and their concentration ranges) are phosphate (0.31–2.34 parts per billion [ppb]), nitrate (0–23.5 ppb), nitrite (0.02–0.52 ppb), ammonia (0.2–3.1 ppb), and silicate (9–90 ppb). In general, the concentration of phosphate increases toward the mouth of Cook Inlet, while the concentrations of nitrate and silicate decrease; the silicate concentration appears to be directly related to the suspended-sediment load (MMS 2003).

4.3.2 Suspended Sediments

Concentrations of suspended sediments in upper Cook Inlet are higher than those in the lower inlet. Suspended particulate matter that is derived from glacier-fed rivers flows into Cook Inlet; tidal currents are major factors affecting sediment distribution and suspension. Near Anchorage, suspended sediments can exceed 2,000 milligrams per liter (mg/L), whereas near the Forelands, suspended sediment concentrations commonly range from 100 to 200 mg/L (MMS 2003). In the Shelikof Straight, suspended sediments range from 0.3 to 2 ppm (Hampton et al. 1986, as cited in MMS 2003).

4.3.3 Sources of Contamination

The principal sources of contaminants entering the marine environment are the following:

- Discharges from municipal wastewater treatment systems
- Industrial discharges that do not enter municipal wastewater systems (petroleum industry and seafood processing)
- Runoff from urban, agricultural, and mining areas
- Accidental spills or discharges of crude or refined petroleum and other substances

Many contaminants in Cook Inlet waters are derived from natural (or nonpoint) sources. Nonpoint sources of water pollution also are multiple, diffuse sources of pollution. The primary nonpoint sources of pollution are runoff from urban areas and communities, farms, and mining areas (MMS 2003).

The principal point sources of contaminants in Cook Inlet are the discharges from municipal wastewater treatment plants, seafood processors, and the petroleum industry. Estimates of the annual suspended solids discharged from the municipalities (2.03 thousand tonnes), refinery (0.03 thousand tonnes), and drilling fluids and cuttings (0.93 thousand tonnes) are only a fraction of the suspended sediments (36,343 thousand tonnes) discharged by the Knik, Matanuska, and Susitna Rivers. Estimates of the annual discharge of biochemical oxygen demand or organic wastes from municipalities (4.27 thousand tonnes), seafood processors (2.52 to 8.58 thousand tonnes), and produced waters from the petroleum industry (3.67 thousand tonnes) are all about the same order of magnitude. Estimates of discharge of several metals in municipal discharges, drilling fluids, and produced waters are small compared with river input.

4.3.3.1 Petroleum Industry

The activities associated with petroleum exploitation that are most likely to affect water quality in the Cook Inlet lease-sale area are (1) the permitted discharges from exploration-drilling units and production platforms, and (2) petrochemical-plant operations. Into 2002, there were 15 oil-production platforms and 1 gas-production platform operating in upper Cook Inlet. In addition, there were 3 production-treatment facilities onshore; produced waters from 10 of the oil-production platforms are treated at these facilities. (In 1992, three oil-production platforms and one production-treatment facility were shut down.) In 2000, the oil-production platforms produced about 9 million barrels of oil and 47 million barrels of produced water (MMS 2003).

4.3.3.2 Exploration and Production Discharges

Petroleum-production operations in upper Cook Inlet discharge a large volume of water and a variety of chemicals used to conduct the various operations associated with petroleum exploration and production.

From the 1960s to the end of 2001, approximately 1,030 million barrels of oil and 978 million barrels of water were produced mainly from four offshore oil fields in upper Cook Inlet. Peak production from these fields occurred in 1970 when about 70 million barrels of oil were produced. By the end of 1975, about 514 million barrels of oil and 61 million barrels of water had been produced—about 50 percent of the total amount of oil and 6 percent of the total amount of water produced from the offshore platforms through 2001 (MMS 2003).

Produced water constitutes the largest source of naturally occurring and man-made substances discharged into the waters. These waters are part of the oil/gas/water mixture produced from the wells and contain a variety of dissolved substances from the geologic formation through which they migrated and in which they became trapped. These can include small quantities of naturally occurring radioactive materials (NORM), although concentrations from fresh water formations such as those that exist under Cook Inlet are usually low. In addition, chemicals are added to the fluids that are part of various activities including water flooding; well work over, completion, and treatment; and the oil/water separation process. These chemicals might include flocculants, oxygen scavengers, biocides, cleansers, and scale and corrosion inhibitors. During the 1987–1988 Cook Inlet Discharge Monitoring Study of production platforms, the types of chemicals added during the various operations ranged from less than 4 to 410 liters per day per platform. The discharge of produced waters is of concern because of the types and amounts of naturally occurring substances they might carry and man-made substances that might be added (MMS 2003).

Before the produced water is discharged into the waters of Cook Inlet, it passes through separators that remove oil and gas. The treatment process removes suspended oil particles from the waters, but the effluent contains dissolved hydrocarbons or hydrocarbons held in colloidal suspension. Relative to the crude oil, the treated produced waters are enriched in the more soluble low-molecular weight saturated and aromatic hydrocarbons. As specified in the NPDES permit, the maximum daily discharge limit of oil and grease in the produced waters discharged into the inlet is 42 parts per million (ppm), and the monthly average is 29 ppm (MMS 2003).

The characteristics of the produced waters that were discharged into Cook Inlet during the Cook Inlet Discharge Monitoring Study have been documented. The biochemical oxygen demand averaged about 10,000 kilograms per day (about 3,662 tonnes/year). The discharges included about 0.9 kilograms of zinc per day (about 0.31 tonnes per year). The amount of oil and grease discharged is about 694 kilograms per day (about 253 tonnes/year), which is about 75 percent of the monthly average specified in the NPDES permit. The Municipality of Anchorage Point Woronzof Wastewater Treatment Facility discharges about 11,670 kilograms of biochemical oxygen demand, 8 kilograms of zinc, and 2,430 kilograms of oil and grease daily. Produced water that is discharged into Cook Inlet contains a variety of hydrocarbons that include benzene (2.280–30.200 ppm), toluene (1.050–15.800 ppm), phenol (0.0005–3.6800 ppm), naphthalene (0.0025–6.500 ppm), fluorene (0.0050–0.118 ppm), pyrene (0.005–1.240 ppm), and chrysene (0.0050–0.0500 ppm) (MMS 2003).

During the Cook Inlet Discharge Monitoring Study, the toxicity of the produced waters was determined by using a standard 96-hour static acute toxicity test (96-hour LC50) on the marine invertebrate *Mysidopsis bahia* (a marine shrimp). The toxicities of the produced waters ranged from 0.27 to 82.47 percent of the effluent; these concentrations equal 2,700 to 824,700 ppm. The classification of relative toxicity of chemicals to marine organisms, proposed by the IMCO/FAO/UNESCO/WHO, provides a system for assessing relative toxicities. Concentrations of less than 1 ppm are very toxic; 1 to 100 ppm are toxic; 100 to 1,000 ppm are moderately toxic, 1,000 to 10,000 ppm are slightly toxic, and greater than 10,000 ppm are practically nontoxic. The produced waters sampled in the monitoring study ranged in toxicity from slightly toxic to practically nontoxic (MMS 2003).

4.3.3.3 Drilling Fluids and Cuttings

The general NPDES permit authorizes the discharge of water based drilling fluids and additives. The permit prohibits the discharge of free oil and diesel oil or mineral oil based drilling fluids and limited the concentration of cadmium and mercury in stock barite that is added to drilling fluids. Drilling fluids consist of water and a variety of additives (Table 3-7); 75 to 85 percent of the volume of most drilling fluids currently used in Cook Inlet is water. When released into the water column, the drilling fluids and cuttings discharges tend to separate into upper and lower plumes (MMS 2003). The discharge of drilling fluids at the surface ensures dispersion and limits the duration and amount of exposure to organisms (MMS 2003). Most of the solids in the discharge (> 90 percent) descend rapidly to the seafloor in the lower plume. The seafloor area in which the discharged materials are deposited depends on the water depth, currents, and material particle size and density. In most areas of the outer continental shelf, the particles are deposited within 150 meters below the discharge site; however, in Cook Inlet, which is considered a high-energy environment, the particles are deposited in an area more than 150 meters below the discharge site (MMS 2003). The physical disturbance of the seafloor caused by the deposition of drilling discharges can be similar to that caused by storms, dredging, disposal of dredged material, or certain types of fishing activities. The upper plume contains the solids and water-soluble components that separate from the material of the lower plume and are kept in suspension by turbulence. Dilution rates as high as 1,000,000:1 can occur for drilling solids within a distance to 200 meters of a platform with surface currents of 30–35 centimeters per second (about 0.6–0.7 knots) (MMS 2003).

Between 1962 and 1994, about 546 wells were drilled in Cook Inlet (MMS 2003). One Continental Offshore Stratigraphic Test (COST) well and 11 exploration wells were drilled in federal waters, and 75 exploration and 459 development and service wells were drilled in state waters, mainly in upper Cook Inlet. From 1962 through 1970, 292 wells were drilled (62 exploration and 230 development and service wells). From 1971 through 1993, the number of wells drilled per year has ranged from 3 to 20; the average number drilled per year is about 11 (MMS 2003).

For the Cook Inlet sale 191 area, it is estimated that (1) the average exploration well will use about 140 tonnes of dry mud and produce approximately 400 tonnes of rock cuttings, and (2) the average development or service well will use approximately 70 tonnes of dry mud and produce about 500 tonnes of cuttings. Table 3-8 shows estimates of the amounts of drilling fluids (125,120 tonnes) and cuttings (268,900 tonnes) discharged into Cook Inlet between 1962 and 1993. The yearly discharge on the basis of drilling 11 wells per year is estimated to be about 3,690 tonnes of drilling fluids and 5,590 tonnes of cuttings. The amount of suspended sediments is estimated to be 10 percent of the discharge, or 928 tonnes (MMS 2003).

The amount of barite (barium sulfate–$BaSO_4$) in the drilling fluids is estimated to be about 63 percent (Table 3-7). Barium makes up about 59 percent of barite or about 37 percent of the drilling fluid. The amount of barium that might have been discharged into Cook Inlet between 1962 and 1993 is estimated to be about 46,200 tonnes. For a single well discharging 330 tonnes of drilling fluids, the amount of barium discharged is estimated to be about 122 tonnes. EPA's limits on the amount of mercury and cadmium in the barite is 1 ppm mercury and 3 ppm cadmium (dry weight); these limits are assumed to be the concentrations of mercury and cadmium in the discharged drilling fluids. The amount of mercury and cadmium discharged per well (based on 330 tonnes of drilling fluids per well) is estimated to be 0.12 kilograms and 0.36 kilograms, respectively. The toxicity (96-hour LC50) of the fluids used to drill 39 production wells in Cook Inlet between August 1987 and February 1991 ranged from 1,955 to more than 1,000,000 ppm for *Mysidopsis bahia* (MMS 2003). The percentage of the wells with toxicities greater than 100,000 ppm was 79 percent; between 10,000 and 100,000 ppm, 10 percent; and between 1,000 and 10,000 ppm, 10 percent. Concentrations greater than 10,000 are practically nontoxic, and those between 1,000 and 10,000 are slightly toxic. The toxicity of the COST well drilling fluid discharges ranged from

(1) 32,000 to 150,000 ppm for shrimp, (2) 3,000 to 29,000 ppm for pink salmon fry, (3) more than 70,000 ppm to more than 200,000 ppm for amphipods, and (4) 10,000 to 125,000 ppm for mysids. Thus, most COST well drilling fluid discharges were practically nontoxic for a variety of marine organisms (MMS 2003).

4.3.3.4 Other Discharges

Seawater is the principal component of most of the discharges; in some cases it is the only constituent. Also, there is a wide range of concentrations of the various additives in the discharges: the rate of adding compounds to the discharge ranges from less than 4 to hundreds of liters per month, while the discharge rates of the various effluents might range from 0 (for intermittent discharges) to tens of cubic meters per day, or more. The produced water-treatment additives include biocides, scale inhibitors, emulsion breakers, and corrosion inhibitors. The range of maximum concentrations and toxicities (96-hour LC50) for the various discharge components are as follows:

- Biocides are about 5 to 640 ppm and slightly to very toxic.
- Scale inhibitors are about 30 to 160 ppm and practically nontoxic to moderately toxic.
- Emulsion breakers are about 10 ppm and toxic.
- Corrosion inhibitors are about 20 to 160 ppm and toxic (MMS 2003).

4.3.3.5 Oil Spills

Oil spills have occurred in Cook Inlet, and these spills and the risk of future spills are an issue of major concern. The oil spill records are not complete for the entire production period of Cook Inlet (1957 to present); however, this section summarizes the available information about the nature of oil spills from production facilities and pipelines in Cook Inlet.

Three pipeline ruptures in 1966, 1967, and 1968 each released approximately 1,400 barrels of oil to Cook Inlet (MMS 2003). Crude- and refined-oil spills from tankers, motor vessels, or other known sources have also occurred in Cook Inlet. The oil spill records are not complete for the entire period of Cook Inlet recorded marine transportation spills (1949 to present); however, the available information is summarized below in Table 4-1.

Table 4-1. Cook Inlet Recorded Marine Transportation Spills

Year	Name	Location	Type	Barrels
1966	Tanker vessel	Nikiski	Diesel	2,000
1966	Tanker vessel	Nikiski	Dock oil	1,000
1967	*Washington Trader*	Drift River	Terminal crude oil	1,700
1976	*Sealift Pacific*	Nikiski	JP-4	9,420
1984	*Cepheus*	Near Anchorage	Jet A	4,286
1987	*Glacier Bay*	Near Kenai	Crude oil	3,095
1989	*Lorna B*	Nikiski	Diesel	1,547–1,714

In addition to the tanker spills, there are at least two documented spills from outside the Cook Inlet area that have drifted into Cook Inlet. The first spill was from an unidentified source documented in 1970.

The suspected source of the spill was from some tank vessel dumping ballast and slop at sea, which used to be a common practice. No oil-spill volume was provided in the spill report. On the basis of the estimated number of dead birds and the length of coastline oiled, it was estimated that this spill was greater than or equal to 1,000 barrels. This spill affected lower Cook Inlet, including the Barren Islands, Kodiak Island, and Shelikof Strait. The second documented tanker spill is the *Exxon Valdez* spill, which drifted into lower Cook Inlet. It is estimated that approximately 1 to 2 percent of the spill entered lower Cook Inlet, reaching as far north as Anchor Point (MMS 2003).

No oil spills due to blowouts were identified in the spill record. However, three natural gas blowouts occurred in Cook Inlet:

- The Pan American blowout occurred during drilling on August 1962 from the Cook Inlet State No. 1 well. The well encountered natural gas and blew gas from August 23, 1962, to October 23, 1963.

- A short-term natural gas blowout occurred at the Grayling Platform in May 1985. Union Oil Company was drilling well G-10RD in the McArthur River Field when the blowout occurred. The event lasted from May 23 to May 26.

- The last blowout in Cook Inlet occurred at the Steelhead Platform from well M-26 on December 20, 1987. Marathon Oil Company was drilling into the McArthur River Field. The gas blowout lasted from December 20, 1987, until December 28, 1987 (MMS 2003).

The reported amount of oil spilled in Cook Inlet waters from 1965 through 1975 was 20,636 barrels; between 1976 and the end of 1979 an additional 9,534 barrels were reported spilled. Of the total hydrocarbons spilled between 1965 and 1979, the aforementioned large spills (equal to or greater than 1,000 barrels) can account for 17,920 barrels out of 30,170, or 59 percent of the total spillage (MMS 2003).

The spill rate for the offshore oil and gas production industry in Cook Inlet is approximately 2,700 small spills (less than 1,000 barrels) per billion barrels. It is estimated that one small pipeline spill per month in the Cook Inlet watershed, onshore and offshore, occurred from 1997 through 2001 (MMS 2003).

The oil industry is not the only or necessarily the primary spiller in Cook Inlet. In the state of Alaska, 269 nonpetroleum-industry oil spills have been reported; the reported amount of oil spilled in 206 of the spills was 22,746 barrels, and no volume was reported for 63 spills. (Nonpetroleum-industry spills included spills from fishing boats, vessels carrying refined products to communities, and other vessels.) Nontank vessels and other unregulated operators had tenfold higher occurrence rates and fiftyfold higher volume spillage than oil industry and other regulated operators in Alaskan waters. This spillage includes sinking of nontank vessels such as tugboats and fishing vessels (MMS 2003). Oily ballast water discharges have occurred and are still occurring in the Gulf of Alaska, including Cook Inlet. Recently, significant enforcement actions have had to be taken against cargo and cruise ships operating in the Gulf of Alaska for deliberately and illegally discharging oily waste (MMS 2003).

Oil sheens observed on the water surface are another source of information about vessel oil spills. During surveillance flights in Prince William Sound and the Gulf of Alaska between September 1989 and September 1990, 260 sheens observed were attributed to sources other than the *Exxon Valdez*; i.e., fishing boats, recreational boats, and cruise ships. The number of non-*Exxon Valdez* slicks was about 31 percent of the total number of slicks observed. The estimated amount of oil in these sheens totaled about 8,100 liters (about 193 barrels) and ranged from less than 1 to 6,000 liters; the largest spill consisted of diesel fuel from a cruise vessel (MMS 2003).

5.0 EFFECTS ON ENDANGERED, THREATENED, AND DEPLETED SPECIES

The ESA Section 7 implementing regulations (50 CFR 402.02) define "effects of the action" as:

> The direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02).

For the federal action considered in this BE, there are no direct effects or consequence to listed species — that is, approving the reissuance of the general NPDES permit oil and gas exploration, development and production facilities located in Cook Inlet, Alaska in and of itself will not change the environmental baseline or directly affect ESA-listed species. However, there are significant indirect effects of reissuing the general permit.

This BE evaluates the discharges and activities that would be authorized under the general NPDES permit for oil and gas exploration, development and production facilities in Cook Inlet, Alaska. The analysis of effects assumes that the species of interest are exposed to conditions that may exist if the NPDES permit conditions are met. Potential effects arising from violations of permit conditions are not evaluated.

There are three possible determinations of effects under the ESA (USFWS and NMFS 1998). The determinations and their definitions are:

- **No Effect (NE)—**the appropriate conclusion when the action agency determines its proposed action will not affect listed species or critical habitat.

- **Is not likely to adversely affect (NLAA)—**the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant effects** relate to the size of the impact and should never reach the scale where take occurs. **Discountable effects** are those extremely unlikely to occur. Using one's best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

- **May affect, likely to adversely affect (LAA)—**the appropriate conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but also is likely to cause any adverse effects, the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation.

For the purposes of Section 7 of the ESA, any action that is reasonably certain to result in "take" is likely to adversely affect a proposed or listed species. The ESA (Section 3) defines "take" as "to harass, harm, pursue, hunt, shoot, wound, trap, kill, capture, collect or attempt to engage in any such conduct." Further, the term "harass" is defined as "an intentional or negligent act that creates the likelihood of injuring wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering" (50 CFR 17.3). The NMFS has interpreted "harm" as "an act that actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, feeding, or sheltering" (NMFS 1999). The USFWS further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering."

5.1 DESCRIPTION OF PARAMETERS OF CONCERN

The general NPDES permit for oil and gas exploration, development and production facilities located in Cook Inlet, Alaska would authorize the activities and discharges described in Section 2.0 of this document. The permit establishes water quality based limitations and monitoring requirements necessary to ensure that the authorized discharges comply with Alaska's water quality standards.

The potential effects of activities and discharges that would be authorized under the general NPDES permit on threatened and endangered species are discussed below.

5.1.1 Drilling Fluids and Cuttings

Drilling fluids, or fluids, are complex mixtures of clays and chemicals, and their potential impact on marine organisms has been examined in several studies. Recent reviews of studies conducted in federal Outer Continental Shelf (OCS) areas include Neff (1982), National Research Council (1983), Petrazzuolo et al. (1985), and Parrish and Duke (1990). Drill cuttings are the waste rock particles that are brought up from the well hole during exploratory drilling operations.

The permit restrictions for drilling fluids and cuttings are provided in Sections 2.3.1.1 and 2.3.1.2, respectively. No discharge of drilling fluids or cuttings would be allowed for new development and production facilities. Existing facilities would be allowed to discharge drilling fluids and cuttings subject to the technology-based restrictions that:

- prohibit the discharge of free oil
- prohibit the discharge of diesel oil
- require a minimum toxicity limit of 3 percent by volume
- allow maximum concentrations of 3 mg/kg cadmium and 1 mg/kg mercury in stock barite
- prohibit the discharge of nonaqueous-based drilling fluids, except those that adhere to drill cuttings
- prohibit the discharge of oil-based drilling fluids, inverse emulsion drilling fluids, oil contaminated drilling fluids, and drilling fluids to which mineral oil has been added

MMS (2003) estimated that the completion of each exploration or delineation well will result in the discharge of an estimated 140 tonnes (metric dry weight) of drilling fluid and 400 tonnes of cuttings. The drilling of production and service wells from an existing platform is estimated to require disposal of 70 tonnes of drilling fluid and 500 tonnes of cuttings per well.

The Offshore Operators Committee (OOC) and Exxon Production Research Company have developed a model (the OOC model) that has been used extensively in Alaskan waters to predict the transport and deposition of drilling fluid. Comparison of model results with field observations has shown that the model is capable of predicting many important aspects of the drilling fluid discharge plume behavior. When released into the water column, the drilling fluid separates into an upper plume, which contains fine-grained solids, and a lower plume, which contains the majority of solids. The fate and transport of cuttings are not predicted by the OOC model. These materials are expected to be of coarser grain size than drilling fluids and will, therefore, settle more rapidly to the seafloor. Model simulations of drilling fluid discharges in Cook Inlet show that both solids and dissolved components are diluted rapidly with distance from the point of discharge. At 100 m (328 ft) from the point of discharge, the dilution factors ranged from 905 to 5,793 for discharges in water depths ranging from 40 m (131 ft) to 120 m (394 ft) (Tetra Tech 1993). Dilution factors for dissolved components ranged from 1,285 to 9,127 for discharges to the same range of water depths (Tetra Tech 1993).

5.1.1.1 Turbidity

Drilling fluids and cuttings discharged into Cook Inlet would increase the turbidity of the water column and the rate of accumulation of particulate matter on the seafloor in the vicinity of the exploratory drilling unit or existing platform. Most of the solids in the discharge (more than 90 percent) are predicted to descend rapidly (within 1 hour) to the seafloor as part of the lower mud plume (MMS 2003). Dye studies and modeling of the discharge plume associated with the drilling of a well in lower Cook Inlet during 1977, at a site between Kachemak and Kamishak bays, indicated rapid dilution to a minimum value of 10,000:1 within 100 m of the drilling vessel (MMS 2003). Following dilution, the increase in turbidity was estimated to be about 8 ppm; background turbidity in the area ranged from 2-20 ppm.

The finer grained material that does not rapidly settle may be kept in suspension by turbulence or settle to the seafloor farther away from the point of discharge. These particulates can cause an increase in turbidity. However, in general, the concentration of suspended particulate matter in the water column is expected to be reduced to levels comparable to naturally occurring suspended particulate matter (1–50 ppm) within about 100–200 meters of the discharge site (MMS 2003).

Only part of the solids in the drilling fluids and cuttings discharged into Cook Inlet may accumulate near the discharge. The bottom currents in lower Cook Inlet are strong enough to prevent the deposition of sand-size and smaller particles. The general southwest flow of Cook Inlet currents indicates that discharged substances that are dissolved or remain in suspension generally would be transported out of the Cook Inlet and into the Gulf of Alaska within about 10 months (MMS 2003).

5.1.1.2 Chemical Toxicity

A variety of Alaskan marine organisms have been exposed to drilling fluid in laboratory or field experiments. Most of these studies have addressed short-term acute effects in a relative or “screening” sense, with little effort directed at separating chemical from physical causes. (In aquatic toxicity tests, a response measuring lethality observed in 96 hours or less is typically considered acute [USEPA 1990]). A few studies have looked at chronic sublethal effects and bioaccumulation of heavy metals from drilling fluid. Chronic refers to a stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span of an organism or more (USEPA 1990). Results are typically reported as LC_{50}s (concentrations lethal to 50 percent of the test organisms) or median effective concentrations (EC50s [concentrations at which a designated effect is displayed by 50 percent of the test organisms]). Because drilling fluid discharges are episodic and typically only a few hours in duration (Jones and Stokes 1990), organisms that live in the water column are not likely to have long-term exposures to drilling fluids and risks to these organisms are best assessed using acute toxicity data. Benthic organisms, particularly sessile species, are likely to be exposed for longer time periods; risks to these organisms are best assessed with chronic toxicity data.

As noted above, the effects of drilling fluids on biological organisms are most commonly assessed by conducting acute laboratory toxicity tests. Results obtained in the majority of studies to date have not shown drilling fluid to have a high degree of acute toxicity (USEPA 1988a; 1988b). For example, Parrish and Duke (1990) reviewed research findings on the toxicity of drilling fluids used in the Gulf of Mexico and concluded that available models suggest that discharges made from oil platforms in open, well-mixed waters deeper than about 20 m (66 ft) will result in no detectable acute effects, except within a few hundred meters of the point of discharge.

The general NPDES permit has incorporated a standard acute toxicity test using the mysid *Mysidopsis bahia.* Under these permits, discharge of drilling fluids with a LC_{5O} of less than 30,000 ppm SPP (suspended particulate phase) is prohibited. The classification of relative toxicity of chemicals to marine organisms proposed by the IMCO/FAO/UNESCO/WHO, reported by Neff (1991), provides a means of qualitatively assessing relative toxicities (MMS 2003). Concentrations less than 1 ppm are classified as very toxic; 1-100 ppm are toxic; 100-1,000 ppm are moderately toxic; 1,000-10,000 ppm are slightly toxic; and greater than 10,000 ppm are practically nontoxic. The NPDES permit would allow discharge of drilling fluids only from exploratory wells and existing platform facilities, and the fluids discharged from these facilities would be considered to be “practically nontoxic.” Drilling fluid toxicity data compiled by EPA (1993) from Alaskan exploratory and production wells indicate that the fluids used in all current and recent operations are acutely toxic only to a slight degree to *Mysidopsis bahia.* LC_{50}s for the 91 valid toxicity test data points ranged from 2,704 to 1,000,000 ppm suspended particulate phase (SPP) with a mean of 540,800 ppm. Only 7 of the 91 tests had LC_{50}s less than the 30,000 ppm limit.

While the discharge of nonaqueous-based drilling fluids will be prohibited under the proposed permit (see Section 2.3.1.1), the discharge of drill cuttings that are generated using nonaqueous-based drilling fluids is proposed to be authorized by the reissued permit. These new discharges are only proposed to be authorized in the territorial seas and federal waters in Cook Inlet. Nonaqueous-based drilling fluids, also known as synthetic-based fluids, are a pollution prevention technology because the drilling fluids are not disposed of through bulk discharge at the end of drilling. Instead, the drilling fluids are brought back to shore and refurbished so that they can be reused. Drilling with synthetic-based fluids allows operators to drill a slimmer well and causes less erosion of the well during drilling than drilling using water-based fluids. Therefore, relative to drilling with water-based fluids, the volume of drill cuttings that are discharged is reduced.

Unlike the water-based drilling fluids, the synthetic-based drilling fluids (SBFs) are water insoluble and do not disperse in the water column as do water-based drilling fluids, but rather sink to the bottom with little dispersion (USEPA 2000). Since 1984, EPA has used the suspended particulate phase toxicity test, an aqueous-phase toxicity test, to evaluate the toxicity of drilling fluids, including SBFs. Using the SPP toxicity test, SBFs have routinely been found to have low toxicity; however, an inter-laboratory variability study indicated that SPP toxicity results are highly variable when applied to SBFs (USEPA 2000). In general, benthic test organisms appear to be more sensitive to the SBFs than water-column organisms. The ranking for SBF toxicity from least toxic to most toxic is: esters < internal olefins < linear alpha olefins < polyalphaolefins < paraffins (USEPA 2000).

Few studies have evaluated impacts on Alaskan species following chronic exposure to drilling fluids. The species that have been tested are all invertebrates. The test results are summarized in Appendix Table F-2 of the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (USEPA 1984). The lowest reported concentration of drilling fluid producing a significant sublethal chronic effect was 50 mg/L for 30 days of continuous exposure with bay mussels, and there was no attempt to separate chemical from physical effects (USEPA 1988a).

A laboratory study examined the chronic toxicity of cuttings from Beaufort Sea wells on the sand dollar (*Echinarachnius parma*) (Osborne and Leeder 1989). Exposure to mixtures as low as 10 percent cuttings/90 percent sand were found to affect the survival of the benthic organisms, with 100 percent mortality occurring within 23 days in some test cases.

5.1.2 Produced Waters

The term "produced water" refers to the water brought up from the oil-bearing subsurface geologic formations during the extraction of oil and gas; it can include formation water, injection water, and any chemicals added to the well hole, or added during the oil/water separation process (USEPA 1996).

All the existing development and production facilities in Cook Inlet are located in coastal waters in the area north of a line extending across Cook Inlet at the southern edge of Kalgin Island (Figure 1). Federal guidelines for the coastal subcategory of oil and gas extraction point source category allow produced waters to be discharged to Cook Inlet coastal waters provided these discharges meet a monthly average oil and grease limit of 29 mg/L and a daily maximum oil and grease limit of 42 mg/L. These limits are contained in the expired general permit for produced water and will be included without modification, for existing facilities only, in the reissued general permit. Produced waters will not be authorized for discharge in either coastal or offshore waters for new sources.

Table 5-1 shows data compiled by EPA (1996) from several sampling programs to characterize the composition of produced water in Cook Inlet.

Table 5-1. Chemical Analyses of Produced Water Samples: Source Samples from Shelikof Strait Sediment Quality Study and Produced Water Samples from the Trading Bay Production Facility Outfall

Parameters	Net Weight (parts per million wet weight)
Total PAH	0.380
Total PHC	6.20
Silver	<0.0001
Arsenic	0.0024
Barium	20.7
Beryllium	<0.0001
Cadmium	0.000
Chromium	0.0032
Copper	0.0060
Iron	0.76
Mercury	<0.0005
Manganese	1.71
Nickel	0.0075
Lead	0.0001
Antimony	0.0001
Selenium	<0.0002
Tin	0.008
Thallium	0.00025
Vanadium	0.067
Zinc	0.0030

Notes:
< = less than
PAH = polycyclic aromatic hydrocarbons
PHC = petroleum hydrocarbons

5.1.3 Mixing Zones and Water Quality Standards

The general NPDES permit will authorize mixing zones as described in Section 2.3.2.1 and require that numeric criteria for chronic aquatic life be met at the boundary of the mixing zone. To evaluate potential affects to ESA-listed species, two issues must be addressed: 1) Whether adverse effects would occur as a result of exposure to contaminant concentrations above water quality standards within the mixing zone boundaries, and 2) whether the water quality standards are protective of ESA-listed species.

5.1.3.1 Mixing Zones

Mixing zones are established by States and EPA to minimize the portion of a waterbody in which water quality criteria are exceeded. Alaska's Water Quality Standards require that when mixing zones are authorized, they be as small as practicable. Numeric criteria for chronic aquatic life and human health protection can be exceeded within the mixing zone, but they must be met at its boundary. The standards (18 AAC 70.255) also require that there is no lethality to organisms passing through mixing zones and that acute aquatic life criteria are met at the boundary of a smaller zone of initial dilution established within the mixing zone.

Alaska's Water Quality Standards do not allow ADEC to authorize mixing zones if the pollutants could bioaccumulate or persist in concentrations above natural levels in the environment, or if they can be expected to cause a carcinogenic or other human health risk. ADEC is required to take into account the potential exposure pathways in determining whether to authorize mixing zones. ADEC has determined that the discharges authorized by the previous permit are not likely to persist in the environment and, therefore, has authorized mixing zones. Mixing zones ranging in size from 20 to 1,420 meters from the discharge point have previously been authorized by the state for Cook Inlet oil and gas facilities.

The size of the mixing zone that is required to meet water quality standards depends upon the concentration of the parameter in the discharge water, how the water is discharged to receiving waters, and the characteristics of the receiving water. ADEC and EPA used the CORMIX dispersion model to calculate the dilution that the effluent plume receives and determine how far from the point of discharge water quality standards would be met. The radii of the mixing zones are shown in Table 2-2. The largest mixing zones would be necessary to meet water quality standard for total aromatic hydrocarbons (TAH)/Total Aqueous Hydrocarbons (TAqH); the proposed mixing zones for existing facilities range from 36 to 3,016 meters (Table 2-2). Mixing zones for whole effluent toxicity, chronic metals, and acute metals have the ranges 31–1,742 m, 9–262 m, and <1–239 m, respectively (Table 2-2).

All the ESA-listed species evaluated in the BE are mobile organisms with extended geographic ranges that includes areas outside the action area for the general NPDES permit. These organisms are unlikely to spend extended periods within the mixing zone boundaries.

5.1.3.2 Water Quality Standards

Because aquatic ecosystems can tolerate some stress and occasional adverse effects, EPA has not deemed it necessary to protect all species at all times and all places (USEPA 1985). EPA guidance suggests that if acceptable data are available for a large number of appropriate taxa from a variety of taxonomic and functional groups, a reasonable level of protection will be provided if all but a small fraction (5 percent) of the taxa is protected (USEPA 1985). Thus, it is conceivable that an individual ESA-listed species may not be protected by a water quality standard.

In June 2003, Alaska submitted revisions to the state's numeric water quality criteria for toxic and other deleterious organic and inorganic substances (18 AAC 70.020(b)) to EPA for approval in accordance with

Section 303(c)(2) of the CWA. The affect of the federal action of approving these criteria, which included acute and chronic marine criteria for the metals found in discharges from oil and gas production facilities (see Table 5-1), on all threatened and endangered species found in Alaskan waters was evaluated in a biological evaluation that was completed in January 2004 (Tetra Tech 2004). This statewide biological evaluation determined that the water quality standards for toxic and other deleterious organic and inorganic substances may affect, but were not likely to adversely affect all the threatened and endangered species considered in this BE.

The previous evaluation of potential affects to ESA-listed species arising from exposure to the Alaska marine water quality standards are adopted by reference in this BE. It is assumed that compliance with the water quality standards as stipulated in the general NPDES permit is not likely to adversely affect ESA-listed species considered in this BE.

5.2 EFFECT DETERMINATIONS

This section provides effect determinations for the 12 ESA-listed and candidate species considered in this BE.

5.2.1 Snake River Fall-Run Chinook Salmon

Distribution data on the ocean distribution of the Snake River fall-run chinook salmon are limited, but the available information indicates that the individuals of this ESU are likely to occur within Alaskan waters. Although, it is not clear whether they occur within Cook Inlet. As ocean-type chinook salmon, fish in Snake River fall-run ESU may range throughout the northern Pacific, and coded wire tagging studies have confirmed the presence of hatchery-raised surrogates in Alaskan fishery harvests (NMFS 1998).

Assuming the possibility that Snake River fall-run chinook salmon may occur within the permit area, the potential for impacts is extremely low. Salmon are mobile and unlikely to spend substantial periods of time within discharge mixing zones; previous work has determined that exposure to discharged pollutant concentrations equal to Alaska water quality standards are not likely to adversely affect this species (see Section 5.1.3.2). The discharge of drilling fluids and cuttings could potentially be a source of localized impacts; however those activities are limited to existing discharges. Existing discharges are found in the northern portion of Cook Inlet, where habitat values are poorer due to naturally high turbidity levels and strong currents. If Snake River fall-run salmon were to be exposed to facilities covered by the general permit, it would more likely be the new source facilities that would occur in the better quality habitat in the southern portion of Cook Inlet. The general permit prohibits the discharge of drilling fluids and cuttings from these facilities reducing the potential for even localized impacts. Vessel traffic and noise associated with exploration and development activities could potentially produce very localized and short-term effects although the mobility of chinook salmon and their transient use of Cook Inlet waters would limit the impact.

The discharges authorized under the general NPDES permit are unlikely to adversely affect Snake River fall-run chinook salmon or their habitat in Cook Inlet. Exposure to anthropogenic noise and vessel traffic associated with oil and gas exploration, development, and production might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.2 Snake River Spring/Summer-Run Chinook Salmon

Distribution data on the ocean distribution of the Snake River spring/summer-run chinook salmon are limited, but the available information suggests that the occurrence of individuals from this ESU within the Cook Inlet is unlikely (Federal Caucus 1999). As stream-type chinook salmon, fish in Snake River spring/summer-run ESU are more likely to remain in coastal waters within 1,000 km from the mouth of the Columbia River (Healey 1991) and Alaska fishery harvest data has not resulted in the recovery of coded wire tagged individuals from spring/summer-runs of Snake River chinook salmon.

Assuming the remote possibility that Snake River spring/summer-run chinook salmon occur within the permit area, the potential for impacts is extremely low. Salmon are mobile and unlikely to spend substantial periods of time within discharge mixing zones; previous work has determined that exposure to discharged pollutant concentrations equal to Alaska water quality standards are not likely to adversely affect this species (see Section 5.1.3.2). The discharge of drilling fluids and cuttings could potentially be a source of localized impacts; however, those activities are limited to existing discharges. Existing discharges are found in the northern portion of Cook Inlet, where habitat values are poorer due to naturally high turbidity levels and strong currents. If Snake River fall-run salmon were to be exposed to facilities covered by the general permit, it would more likely be the new source facilities that would occur in the better quality habitat in the southern portion of Cook Inlet. The general permit prohibits the discharge of drilling fluids and cuttings from these facilities reducing the potential for even localized impacts. Vessel traffic and noise associated with exploration and development activities could potentially produce very localized and short-term effects although the mobility of chinook salmon and their transient use of Cook Inlet waters would limit the impact.

The discharges authorized under the general NPDES permit are unlikely to adversely affect Snake River fall-run chinook salmon or their habitat in Cook Inlet. Exposure to anthropogenic noise and vessel traffic associated with oil and gas exploration, development, and production might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.3 Snake River Sockeye Salmon

Data on the ocean distribution of Snake River sockeye salmon are limited due to the size of the population and difficulties with sampling methodology. Information available more broadly for Washington and British Columbia stocks indicate that they reach the Gulf of Alaska. Within the Gulf of Alaska, these stocks' northernmost distribution are limited to the area south and east of Kodiak Island (Bugner 1991). Because the Snake River sockeye ESU can be assumed to be distributed similarly to the other Washington and British Columbia stocks, Cook Inlet is outside the known range of the Snake River sockeye ESU. The issuance of the permit therefore is **not likely to adversely affect** (**NLAA)** this species.

5.2.4 Short-Tailed Albatross

Available data do not suggest that Cook Inlet waters lie within the typical geographic range of this species. Breeding activities and chick-raising occurs in the vicinity of Japanese islands, and thus, discharges authorized under the permit will have no effect on breeding or foraging activities to support fledgling chicks.

Adult birds may occasionally occur within the geographic area covered by the general permit. Exposure to oil spills are considered to pose a potential threat to the species' conservation and recovery due to damage related to oil contamination, which could cause physiological problems from petroleum toxicity and by interfering with the bird's ability to thermoregulate. The NPDES permit prohibits the discharge of free oil, but allows the discharge of produced waters, subject to a monthly average oil and grease limit of 29 mg/L, from existing facilities. Existing facilities that will be allowed to discharge produced waters are in the northern portion of Cook Inlet, far from the preferred pelagic habitat of adult birds.

Considering the geographic distribution of short-tailed albatross, the low probability that this species will use waters in close proximity to permitted activities, and the conclusion that permitted actions would have little effect on the bird's behavior, foraging ability, or prey species, it is concluded that the issuance of the permit might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.5 Steller's Eider

Steller's eiders are not reported to nest in any locations within or near the proposed area of coverage for the general permit. However, molting and wintering habitat is thought to extend throughout southern Cook Inlet, approximately as far north as the Trading Bay (USFWS 2003). Wintering Steller's eider usually occur in waters less than 10 m (30 ft) deep and are, therefore, usually found within 400 m (400 yd) of shore except where shallows extend further offshore in bays and lagoons (USFWS 2002). Wintering birds are from both the Alaskan and Russian breeding populations; USFWS assumes that 4.2 percent of the birds are from the ESA-listed Alaskan population and the remaining 95.8 percent are from the nonendangered Russian breeding population.

All the existing oil and gas production facilities are in northern Cook Inlet and with the exception of the East Foreland facilities appear not to fall within mapped winter habitat. The birds would not be expected to occupy areas within the designated mixing zones because of their preference for nearshore, shallow foraging habitat. Exposure to discharge waters that comply with chronic water quality standards are not expected to adversely affect Steller's eider (see Section 5.1.3.2).

The potential for adverse impacts to Steller's eider from the discharge of drilling fluids and cuttings authorized under the permit depends upon where discharges would occur, although any effects are expected to be insignificant. The permit does not allow discharges in water depths less than 5 m (birds usually occur in water less than 10 m). The deposition of drilling fluids in shallow waters could alter benthic habitat and adversely affect shallow water mollusks and crustaceans that Steller eiders feed upon. These affects would extend over only a very small fraction of the bird's available winter range and would not noticeably impact overall prey abundance and availability.

Wintering Steller's eider could be affected by low-flying aircraft, vessel traffic, noise and movement associated with drilling rigs, production facilities, and well abandonment. Repeated disturbance of concentrations of wintering birds could cause the birds to expend greater amounts of energy due to increased movements, or stress, and could lessen their ability to survive the winter. These activities could also cause the birds to abandon some foraging areas and relocate to other areas, thereby increasing the number of birds feeding on the same resources.

The permit prohibits discharge of free oil; however, the oil and gas operations regulated under the permit do pose a potential risk to Steller's eiders from oil spills. Any species that becomes contaminated through inhalation, ingestion, or direct contact may suffer mortality, or lesser sublethal effects that reduce fitness. The number of individuals that could be affected and the severity of impacts would depend upon the size of the spill, the distribution of the spill, the timing of the spill (birds are not present year-round), and the severity of exposure. Oil spills could directly impact Steller's eider, adversely affect nearshore habitat, and could impact their food resources depending upon the nature of spill events.

On the basis of the above rationale, it is concluded that the issuance of the permit might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.6 Blue Whale

Available evidence indicates that blue whales are unlikely to inhabit Cook Inlet waters at any time of the year. While they are seasonally present in the Gulf of Alaska, they are typically offshore and relatively rare (MMS 2003). The issuance of the permit is **not likely to adversely affect** (**NLAA**) this species.

5.2.7 Fin Whale

The discharges authorized under the general permit are unlikely to adversely impact fin whales. These mobile organisms are unlikely to spend substantial amounts of time within discharge mixing zones, and previous work has determined that exposure to discharged pollutant concentrations equal to the Alaska water quality standards are not likely to adversely affect this species (see Section 5.1.3.2).

Fin whales could be adversely affected by noise associated with seismic exploration and oil and gas facility operations. Long-term impacts of oil- and gas-related noise on the hearing abilities of individual marine mammals are unknown. However, anthropogenic sound has been reported to impact the navigational, foraging, reproductive, and hearing capabilities of whales (e.g., Romano et al. 2004). MMS (2003) concluded that fin whales could be affected primarily by noise associated with oil and gas exploration and development activities in Cook Inlet.

Vessel traffic associated with the support and operation of oil and gas facilities pose an increased risk to fin whales. A ship strike has been implicated in the death of a single fin whale in Uyak Bay, Alaska in 2000 (NMFS 2003). Additional mortality from ship strikes that are unreported might occur.

The discharges authorized under the general NPDES permit are unlikely to adversely affect fin whale or their habitat in Cook Inlet. Exposure to anthropogenic noise and vessel traffic associated with oil and gas exploration, development, and production might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.8 Humpback Whale

The discharges authorized under the general permit are unlikely to adversely impact humpback whales. These mobile organisms are unlikely to spend substantial amounts of time within discharge mixing zones and previous work has determined that exposure to discharged pollutant concentrations equal to the Alaska water quality standards are not likely to adversely affect this species (see Section 5.1.3.2).

Humpback whales could be adversely affected by noise associated with seismic exploration and oil and gas facility operations. Long-term impacts of oil- and gas-related noise on the hearing abilities of individual marine mammals are unknown. However, anthropogenic sound has been reported to impact the navigational, foraging, reproductive, and hearing capabilities of whales (e.g., Romano et al. 2004). Humpbacks exhibit variable responses to noise, and the level and type of response exhibited by whales has been correlated to group size, composition, and apparent behaviors at the time of possible disturbance. Humpback whales have suffered severe mechanical damage to their ears from noise pulses from underwater blasting; whales exposed to playbacks of noise from drillships, semisubmersibles, drilling platforms, and production platforms do not exhibit avoidance behaviors at noise levels up to 116 db (Malme et al. 1985). MMS (2003) concluded that humpback whales are the most likely of the baleen whales to be impacted by noise associated with oil and gas exploration and development activities in Cook Inlet.

Vessel traffic associated with the support and operation of oil and gas facilities pose an increased risk to humpback whales. Direct ship strikes are a significant source of mortality in the eastern North Pacific stock of humpback whales in California, Oregon, and Washington waters, where there is an average of 0.6 whales killed per year (Perry et al. 1999). Little information is available on mortality rates from ship strikes for humpback whales in Alaskan waters. One pregnant humpback whale was reported killed by a cruise ship in Glacier Bay in July 2001 (Richardson 2003). Additional mortality from ship strikes that are unreported may occur.

The discharges authorized under the general NPDES permit are unlikely to adversely affect humpback whales or their habitat in Cook Inlet. Exposure to anthropogenic noise and vessel traffic associated with oil and gas exploration, development, and production might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.9 Northern Right Whale

There is no evidence that northern right whales ever inhabited Cook Inlet waters. These whales do occur in the Gulf of Alaska and any impacts to this species would be significant given their extremely small population size. However, given that this species is extremely rare in Alaskan waters and occurs only in waters well outside the action area, it is concluded that the issuance of the permit is **not likely to adversely affect** (**NLAA)** this species.

5.2.10 Sei Whale

Sei whales are observed very rarely in Shelikof Strait and waters adjacent to Kodiak Island, with one recorded sighting in lower Cook Inlet (MMS 2003). The whales are seasonally present in the Gulf of Alaska but prefer deeper offshore waters, with preferred habitat tending to occur in offshore areas that encompass the continental shelf break (Gregr and Trites 2001). It is very unlikely that sei whales would occur in any areas impacted by discharges authorized under the general NPDES permit. In addition, the whales are not likely to be in areas impacted by any noise associated with oil and gas, exploration, development, or production (MMS 2003). The issuance of the permit is **not likely to adversely affect (NLAA)** this species.

5.2.11 Sperm Whale

Sperm whale females and calves do not inhabit Cook Inlet waters or regions of the Gulf of Alaska adjacent to Cook Inlet. Males lead a mostly solitary life after reaching sexual maturity between 9 and 20 years of age and are thought to move north in the summer to feed in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands. They prefer deeper water habitat along the continental shelf break (Gregr and Trites 2001). It is very unlikely that sperm whales would occur in any areas impacted by discharges authorized under the general NPDES permit. In addition, the whales are not likely to be in areas impacted by any noise associated with oil and gas, exploration, development, or production (MMS 2003). The issuance of the permit is **not likely to adversely affect** (**NLAA)** this species.

5.2.12 Northern Sea Otter

Sea otters generally occur in shallow water areas near the shoreline where they forage in shallow water. Visual observation of 1,251 dives by sea otters in southeast Alaska, indicates that foraging activities typically occurs in water depths ranging from 2 to 30 m (7 to 98 ft), although foraging at depths up to 100 m (328 ft) was observed (Bodkin et al 2004). The home ranges of sea otters in established populations are relatively small. Sexually mature females have home ranges of 8–16 km (5–10 miles). Breeding males remain for all or part of the year within the bounds of their territory, which constitutes a length of coastline from 100 m (328 ft) to 1 km (0.6 mile).

Drilling fluid discharges could adversely affect local otter populations that forage in the vicinity of these discharges by altering prey availability due to the burial of benthic organisms, or changes in bottom habitat characteristics. Exposure to increased pollutant concentrations within designated mixing zones are unlikely to cause adverse effects to otters as they are unlikely to be attracted to these areas and would be expected to have minimal exposures. Exposure to discharge waters that comply with chronic water quality standards are not expected to adversely affect northern sea otter (see Section 5.1.3.2).

While noise and disturbance associated with oil and gas exploration and development may have local effects on the behavior and distribution of otters, they are not thought to have significant population impacts (MMS 2003). Reidman (1983; 1984) reported no change in the behavior of otters during underwater playbacks of drillship, semisubmersible, and production platform sounds. Most animals were 40 meters of more from the sound source and continued to dive and feed.

Vessel traffic associated with the support and operation of oil and gas facilities could disturb sea otters in some areas. In summer, vessel traffic associated with oil and gas operations is likely to be insignificant compared to the quantity of boat traffic from fishing, tourism, and shipping. However, in winter, boat traffic in a remote region could have local impacts on the distribution of females and pups (MMS 2003). While males sometimes become accustomed to heavy boat traffic, female sea otters, particularly those with pups, are sensitive to disturbance.

The permit prohibits discharge of free oil; however, the oil and gas operations regulated under the permit do pose a potential risk to northern sea otters from oil spills. Any species that becomes contaminated through inhalation, ingestion, or direct contact may suffer mortality, or lesser sublethal effects that reduce fitness. The number of individuals that could be affected and the severity of impacts would depend upon the size and distribution of the spill. Oil spills could directly impact sea otters, adversely affect nearshore habitat, and could impact their food resources depending upon the nature of spill events.

The discharges authorized under the general NPDES permit may impact local populations of northern sea otter by altering prey availability, modifying behavior, and changing the distribution of sea otters. These impacts are unlikely to have a significant effect on the overall populations as the impact areas would be small in relation to the total habitat available to sea otters in Cook Inlet. Exposure to anthropogenic noise and vessel traffic could also modify the behavior and distribution of local sea otter populations. The issuance of the permit might affect, but is **not likely to adversely affect** (**NLAA)** this species.

5.2.13 Steller Sea Lion

Steller sea lion is the only ESA-listed species with designated critical habitat within the geographic area of coverage for the general NPDES permit. Critical habitat occurs at Cape Douglas, the Barren Islands, and marine areas adjacent to the southwestern Kenai Peninsula. There is additional critical habitat including rookeries, haulouts, and marine foraging areas for the western population of sea lions in areas near the proposed permit action area within the Shelikof Strait and areas along the southern side of the Alaska Peninsula (MMS 2003). Critical habitat includes a terrestrial zone that extends 3,000 ft (0.9 km) landward from the baseline or base point of each major rookery and major haulout in Alaska. It also includes an air zone that extends 3,000 ft (0.9 km) above the terrestrial zone of each major haulout or rookery. Critical habitat within marine waters for the western population that occurs within the permit action area extends 20 nautical miles (37 km) seaward in state and federally managed waters from the baseline or basepoint of each rookery or major haulout area (NMFS 1993b).

Drilling fluid discharges are unlikely to adversely impact the Steller sea lion. Critical habitat restrictions do not allow discharges in the vicinity of Steller sea lions. Drilling fluid discharges are rapidly diluted and the majority of deposition generally occurs within 100 m of the point of discharge (Tetra Tech 1993). The rapid dilution and low toxicity of drilling fluids discharged in Cook Inlet imply that these discharges would not be likely to adversely affect pollock or other Steller sea lion prey.

Exposure to increased pollutant concentrations within designated mixing zones are unlikely to cause adverse effects to sea lions because they are unlikely to be attracted to these areas and would be expected to have minimal exposures. Exposure to discharge waters that comply with chronic water quality standards are not expected to adversely affect Steller sea lions (see Section 5.1.3.2).

Steller sea lions are believed to be less likely to be adversely affected by underwater noise than whales (MMS 2003). The NMFS has determined that a threshold of 190 decibels must be reached before injury would occur (67 FR 35793, May 21, 2002). Airborne sounds are of special concern. Sea lion pups on land are vulnerable to trampling if adults are panicked by low aircraft noises (MMS 2003). The aerial and aquatic critical habitat distance restrictions should ensure that this species is unlikely to be adversely impacted by noise associated with oil and gas exploration, development, and production activities.

The permit prohibits discharge of free oil; however, the oil and gas operations regulated under the permit do pose a potential risk to sea lions from oil spills. Any species that becomes contaminated through inhalation, ingestion, or direct contact may suffer mortality, or lesser sublethal effects that reduce fitness. The number of individuals that could be affected and the severity of impacts would depend upon the size and distribution of the spill. Oil spills could directly impact sea lions, adversely affect critical habitat, and could impact their food resources depending upon the nature of spill events.

The discharges authorized under the general NPDES permit are unlikely to adversely affect the western population of Steller sea lion. Exposure to anthropogenic noise and vessel traffic are unlikely to modify the behavior and distribution of sea lions due to the critical habitat restrictions that prevent aircraft and vessels from operation near critical habitat. The issuance of the permit is **not likely to adversely affect (NLAA)** this species.

5.3 DEPLETED STOCK ASSESSMENT

The Cook Inlet beluga whale stock is designated as depleted and is a federal species of concern. The MMPA does not require a formal determination for species listed as depleted; however, this assessment is included because issuance of the permit has the potential to affect the species.

5.3.1 Beluga Whale

Beluga whales have been observed throughout Cook Inlet but are concentrated in the tidal flats, river mouths, and estuaries in the northern portions of the inlet throughout the summer. The whales are thought to move to deeper waters in winter, ranging as far south as Chinitna Bay and Tuxedni Bay, although they have been observed in the Knik and Turnagin arms in February and March (NMFS 2005f). The draft conservation plan for the Cook Inlet beluga whale stock identifies the Knik and Turnagin arms, Chickaloon Bay and at the mouths of rivers, as the highest value and most sensitive habitat for the whales (NMFS 2005f). Permit activities would occur outside the high summer concentration areas in Type 1 and Type 2 habitats as identified in the draft conservation plan as a result of ADNR restrictions on the location of oil leases in the upper Cook Inlet and the permit's prohibition of activities within 4,000 meters of the mouth of a river, river delta, or coastal marsh. During winter, when beluga whales are distributed more widely throughout the inlet, the whales occur within the area covered by the permit.

Drilling fluid discharges could adversely affect prey availability in the immediate vicinity of the discharges because of the burial of benthic organisms or changes in bottom habitat characteristics. Such effects would be of limited size and duration. Exposure to increased pollutant concentrations within designated mixing zones are unlikely to cause adverse effects to beluga whales because of the whales' mobility and limited amount of time within spent within these areas. Exposure to discharge waters that comply with chronic water quality standards are not expected to adversely affect beluga whales (see Section 5.1.3.2).

Beluga whales are susceptible to vessel strikes and could potentially be affected by vessels supporting oil and gas operations. However, small craft associated with recreation and sport and commercial fishing have been identified as a greater concern because of their presence in the shallow waters that coincide with the summer use of these areas by beluga whales (NMFS 2005f). An acoustics study conducted within Cook Inlet that included the effects of noise from offshore oil platforms concluded that sounds would likely have only a minor effect on beluga whales (Blackwell and Greene 2002).

The permit prohibits discharge of free oil; however, the oil and gas operations regulated under the permit do pose a potential risk to beluga whales from oil spills. The effects of oil spills on beluga whales are not well known, although most organisms that become contaminated through inhalation, ingestion, or direct contact may suffer mortality, or lesser sublethal effects that reduce fitness. The number of individuals that could be affected and the severity of impacts would depend upon the size and distribution of the spill and the time of year during which it occurred. Oil spills could also indirectly affect beluga whales by impacting nearshore habitat and their food resources, depending upon the nature of the spill event.

The permit has been developed with consideration of the protection measures, including the avoidance of Type 1 and 2 habitats outlined in the NMFS draft conservation plan. The discharges authorized under the general NPDES permit may affect individual beluga whales either directly or indirectly however, they are not likely to contribute to a further decline of the Cook Inlet beluga whale stock or affect the recovery of the population as a whole.

5.4 CUMULATIVE EFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions on endangered and threatened species or their critical habitat that are reasonably certain to occur in the action area considered in this Biological Evaluation. Cumulative effects may also affect the Cook Inlet stock of beluga whales, which are also considered in this assessment.

Recreation and commercial uses of the Cook Inlet basin include sport fishing and hunting, fish processing, guide services, timber harvesting and restoration, mining and reclamation, agriculture and mariculture, recreation and tourism, and public works projects, along with oil and gas exploration and development. Of these, oil and gas development is the main agent of industrial-related change in the Cook Inlet area.

Oil and gas exploration and production activities have occurred in the Cook Inlet basin for more than 50 years. In the late 1950s and the 1960s, several commercial oil and gas fields were discovered. Many of the commercial-sized fields discovered during that time are still producing today. Cook Inlet oil production, which peaked at 230 thousand barrels per day in 1970, declined to 27.5 thousand barrels per day by 2003. Cumulative production between 2004 and 2009 is an estimated 42.6 million barrels. Oil production in Cook Inlet is expected to continue to 2016. Cook Inlet natural gas production reached 217 billion cubic feet (bcf) per year in 1984, and peaked at 223 bcf in 1996. Natural gas production has remained relatively stable at an average of 213 bcf per year from 1997 to 2001. In 2003, gas production was at 208 bcf per year, and cumulative production for 2004 through 2009 is an estimated 1,131 bcf. Natural gas production in Cook Inlet is expected to continue beyond 2022 (ADNR DOG 2004).

The cumulative impact analysis considers the past and current lease sale activities; past oil and gas exploration and production; oil and gas discoveries that have a reasonable chance of being developed during the next 15 to 20 years; and speculative exploration and development of additional undiscovered resources (onshore and offshore) that could occur during the next 15 to 20 years.

Although the ratio of produced water to oil will continue to increase from existing Cook Inlet production facilities, discharges from these facilities are not anticipated to have cumulative effects according to the modeling conducted for this permit reissuance. Produced water discharges from a multiple-well production platform would likely be injected into underlying formations. Even if discharged, produced water would not be expected to degrade the quality of Cook Inlet water. The routine other discharges associated with oil production are not expected to cause any overall degradation of Cook Inlet water quality (MMS 2003). Therefore, no cumulative effects would be expected to threatened and endangered species.

5.4 INTERDEPENDENT/INTERRELATED ACTIONS

Interdependent actions are defined as actions with no independent use apart from the proposed action. Interrelated actions are those that are a part of a larger action and depend upon the larger action for justification.

There are no interdependent or interrelated actions expected as a result of the issuance of the general NPDES permit for oil and gas exploration, development, and production facilities in state and federal waters in Cook Inlet, Alaska.

6.0 CONCLUSION

The federal action that is the subject of this Biological Evaluation (BE) is the issuance of NPDES Permit No. AK-G31-5000: Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) for Oil and Gas Extraction Facilities in Federal and State Waters in Cook Inlet.

The analysis of effects in this BE assumed that the species of interest are exposed to conditions that will exist if the NPDES permit conditions are met. Potential effects arising from violations of permit conditions were not evaluated. The determinations of effects for the 13 species of interest evaluated in this BE are shown in Table 6-1 below.

Table 6-1. Effects Determinations

Species	Population	Effects Determination
Chinook Salmon	Snake River Fall run	NLAA
	Snake River spring/summer run	NLAA
Sockeye Salmon	Snake River	NLAA
Short-tailed Albatross	U.S. Waters	NLAA
Steller’s Eider	Alaska	NLAA
Northern Right Whale	North Pacific	NLAA
Sei Whale	North Pacific	NLAA
Blue Whale	North Pacific	NLAA
Fin Whale	Northeast Pacific	NLAA
Humpback Whale	North Pacific	NLAA
Sperm Whale	North Pacific	NLAA
Beluga Whale	Cook Inlet Stock	NLAA
Steller Sea Lion	Western (West of 144° W longitude) Eastern (East of 144° W longitude)	NLAA NLAA
Northern Sea Otter	Southwest Alaska	NLAA
NE = No Effect NLAA = Not Likely to Adversely Affect		

The Cook Inlet beluga whale stock is considered depleted and is also a federal species of concern. This stock was also considered within the BE using the same criteria as that employed for threatened and endangered species. Issuance of the permit is not likely to contribute to the decline or adversely affect the recovery of the Cook Inlet stock of beluga whales.

7.0 REFERENCES

Alaska Department of Natural Resources, Division of Oil and Gas (ADNR DOG). 2004. *Alaska Oil and Gas Report, December 2004*. <http://www.dog.dnr.state.ak.us/oil/products/publications/annual/report.htm>. Accessed May 16, 2005.

Alaska Department of Fish & Game (ADFG). 1994a. Blue whale. Last updated May 23, 2005. <http://www.adfg.state.ak.us/pubs/notebook/marine/blue.php>.

Alaska Department of Fish & Game (ADFG). 1994b. Humpback whale. Last updated May 23, 2005. <http://www.adfg.state.ak.us/pubs/notebook/marine/humpback.php>.

Alaska Department of Fish & Game (ADFG). 1994c. Steller's sea lion. Last updated May 23, 2005. <http://www.adfg.state.ak.us/pubs/notebook/marine/sealion.php>.

Alaska Department of Fish & Game (ADFG). 1994d. Sea otter. Last updated May 23, 2005. <http://www.adfg.state.ak.us/pubs/notebook/marine/seaotter.php>.

Alaska Department of Fish & Game (ADFG). 1994e. Beluga whale. Last updated May 23, 2005. <http://www.adfg.state.ak.us/pubs/notebook/marine/beluga.php>.

Alaska Natural Heritage Program (AKNHP). 2005. Sperm whale. NatureServe database. <http://aknhp.uaa.alaska.edu/zoology/species_ADFG/Status_reports/ADFG_PDFs/Mammals/Sperm_whale_ADFG_web_060205.pdf>.

American Cetacean Society (ACS). 2004. Sperm whale. American Cetacean Society fact sheet. Last modified July 21, 2005. <http://www.acsonline.org/factpack/spermwhl.htm>.

Angliss, R.P. and K.L. Lodge. 2003. Alaska marine mammal stock assessments 2003. NOAA-TM-AFSC-144. National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle, Washington.

Associated Press. 2004. Fin whale sighting marks a historic return to Southeast. September 21, 2004. <http://www.iwc.org/work/finwhale_9_22_04.htm>. Accessed August 27, 2005.

Bjornn, T.C., and C.A. Peery. 1992. *A review of literature related to movements of adult salmon and steelhead past dams and through reservoirs in the lower Snake River*. Technical report 92-1. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho. U.S. Army Corps of Engineers, Walla Walla, Washington.

Bjornn, T.C., D.R. Craddock, and D.R. Corley. 1968. Migration and survival of Redfish Lake, Idaho, sockeye salmon, *Oncorhynchus nerka*. *Transactions of the American Fisheries Society*. 97:360-373.

Blackwell, S.B. and C.R. Greene. 2002. *Acoustic measurements in Cook Inlet, Alaska, during 2001*. Report from Greeneridge Sciences, Inc. Aptos, CA for NMFS, Anchorage, AK.

Bodkin, J.L., G.G. Esslinger, and D.H. Monson. 2004. Foraging depths of sea otters and implication to coastal marine communities. *Marine Mammal Science* 20: 305-321.

Burgner, R.L. 1991. Life history of sockeye salmon (*Oncorhynchus nerka*). In: C, Groot and L. Marcolis (eds.). *Pacific Salmon*. UBC Pres, Vancouver, Canada.

Cannamela, D.A. 1992. *Potential impacts of releases of hatchery steelhead trout "smolts" on wild and natural juvenile chinook and sockeye salmon*. Idaho Department of Fish and Game, Boise, ID.

Center for Biological Diversity (CBD). 2000. Petition to revise the critical habitat designation for the northern right whale (*Eubalaena glacialis*) under the Endangered Species Act. Center for Biological Diversity. Berkeley, CA. <http://www.biologicaldiversity.org/swcbd/species/right/petition.pdf>.

Columbia Basin Fish and Wildlife Authority (CBFWA). 1990. *Snake River subbasin (mainstem from mouth to Hells Canyon Dam) salmon and steelhead production plan*. CBFWA, Northwest Power Planning Council, Portland, Oregon.

Chapman, D., A. Giorgi, M. Hill, A. Maule, S. McCutcheon, D. Park, W. Platts, K. Prat, J. Seeb, L. Seeb, and F. Utter. 1991. *Status of Snake River chinook salmon*. Don Chapman Consultants, Inc., Boise, Idaho.

Cramer, S.P. 1990. *The feasibility for reintroducing sockeye and coho salmon in the Grande Ronde River and coho and chum salmon in the Walla Walla River*. Progress Report prepared for Nez Perce Tribe, Umatilla Confederated Tribes, Warm Springs Confederated Tribes, and Oregon Department of Fish and Wildlife by S. P. Cramer and Associates, Gresham, Oregon, 132 p.

Environment Canada. 2004a. *Species at Risk: Sei whale, Pacific population*. Environment Canada. Last update: November 10, 2004. <http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=755>.

Environment Canada. 2004b. Species at Risk: Blue whale, Pacific population. Environment Canada. Last modified: August 12, 2005. < http://www.dfo-mpo.gc.ca/species-especes/species/species_blueWhale_Pacific_e.asp>.

Fisheries and Oceans Canada. 2005. *Backgrounder. Sei whale*. BG-PR-05-015c-e. Fisheries and Oceans Canada. August 18, 2005. <http://www-comm.pac.dfo-mpo.gc.ca/pages/release/bckgrnd/2005/bg015c_e.htm>.

Fish Passage Center (FPC). 2003. *Fish Passage Center annual report–2002*. Fish Passage Center, Columbia River Basin Fish and Wildlife Authority, Portland, OR.

Fritz, L.W. and C. Stinchcomb. 2005. Aerial, ship, and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in the western stock in Alaska, June and July 2003 and 2004.

Gregr, E.J. and A.W. Trites. 2001. Predictions of critical habitat for five whale species in the waters of coastal British Columbia. *Can. J. Fish. Aquat. Sci*. 58: 1265-1285.

Gustafson, R.G., T.C. Wainwright, G.A. Winans, F.W. Waknitz, L.T. Parker, and R.S. Waples. 1997. *Status review of sockeye salmon from Washington and Oregon* (NOAA Technical Memorandum NMFS-NWFSC-33). National Marine Fisheries Service, Northwest Fisheries Science Center, Conservation Biology Division, Seattle, Washington. 282 pp. <http://www.nwfsc.noaa.gov/publications/techmemos/index.cfm#97>.

Hart, J.L. 1973. Pacific Fishes of Canada. *Fisheries Research Board of Canada Bulletin.* 180: 118-123.

Healy, M.C. 1991. Life history of Chinook salmon. In: C. Groot and L. Margolis (Eds.). *Pacific Salmon Life Histories*. UBC Press, Vancouver, B.C., Canada.

High Seas Salmon Research Program (HSSRP). 2004. Known *ocean ranges of Pacific salmon and steelhead from high seas tagging research*. <http://www.fish.washington.edu/research/highseas/known-range.html>.

Irving, J.S., and T.C. Bjornn. 1981. *Status of Snake River fall chinook salmon in relation to the Endangered Species Act*. Idaho Cooperative Fishery Research Unit, University of Idaho, Moscow, for U.S. Fish and Wildlife Service.

Joling, D. 2004. *Rare blue whales spotted in Alaska*. Associated Press. July 28, 2004. <http://www.msnbc.msn.com/id/5538657/>. Accessed August 5, 2005.

Leatherwood, S., R.R. Reeves, W.F. Perrin, and W.E. Evans. 1982. *Whales, dolphins, and porpoises of the eastern North Pacific and adjacent Arctic waters: a guide to their identification*. U.S. Dept. Commerce, NOAA Tech. Rep. NMFS Circular 444, 245 pp.

Loughlin, T.R., A.S. Perlov, and V.A. Vladimirov. 1992. Range-wide survey and estimation of total abundance of Steller sea lion in 1989. *Marine Mammal Sci*. 8: 220-239.

Loughlin, T.R. and A.E. York. 2000. An accounting of the sources of Steller sea lion, *Eumetopias jubatus,* mortality. *Marine Fisheries Review* 62: 40-45.

Malme, C.I., P.R. Miles, P. Tyack, C.W. Clark, and J.E. Bird. 1985. *Investigation of the potential effects of underwater noise from petroleum industry activities on feeding humpback whale behavior*. Prepared by BBN Labs, Inc., Cambridge, Massachusetts for U.S. Minerals Management Service, Anchorage, Alaska. OCS Study MMS 85-0019.

McClure, M., B. Sanderson, E. Holmes, C. Jordan, P. Kareiva, and P. Levin. 2000. *Revised Appendix B of standardized quantitative analysis of the risks faced by salmonids in the Columbia River basin*. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

McNeil, W. J and D. C. Himshworth. 1980. *Slamonid Eocsystems of the North Pacific.* Oregon State University Press, Corvallis, Oregon.

Marine Mammal Commission (MMC). 2002. Annual report for 2002. North Pacific right whale (*Eubalaena japonica*). <http://www.mmc.gov/species/pdf/ar2002northernrightwhale.pdf>.

Minerals Management Service (MMS). 2003. Cook Inlet Planning Area. Oil and Gas Lease Sales 191 and 199. Final Environmental Impact Statement. OCS EIS/EA MMS 94-0066. U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf, Anchorage, AK.

Mizroch, S.A., D.W. Rice, and J.M. Breiwick. 1984. The blue whale, *Balaenoptera musculus*. *Mar. Fish. Rev*. 46: 15-19.

National Academies. 2002. Too *few clues to solve mystery of Steller sea lion's decline; monitoring of controlled fishing areas may provide answers*. News release dated Dec. 4, 2002. <http://www4.nas.edu/news.nsf/isbn/12042002?openDocument>.

National Marine Fisheries Service (NMFS). 1990a. Listing of Steller sea lions as threatened under Endangered Species Act with protective regulations. *Federal Register*. April 5, 1990. 55:12645-12663.

National Marine Fisheries Service (NMFS). 1990b. Listing of Steller sea lions as threatened under Endangered Species Act. *Federal Register*. November 26, 1990. 55:49204-49241.

National Marine Fisheries Service (NMFS). 1991. Endangered and Threatened Wildlife and Plants; Identification of Candidate Species for Listing Under the Endangered Species Act. *Federal Register*. June 11, 1991. 55:26797-26798.

National Marine Fisheries Service (NMFS). 1992. Endangered and Threatened Species; Threatened Status for Snake River Spring/Summer Chinook Salmon, Threatened Status for Snake River Fall Chinook Salmon. *Federal Register*. April 4, 1991. 57:14653.

National Marine Fisheries Service (NMFS). 1993a. Designated Critical Habitat; Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, and Snake River Fall Chinook Salmon. *Federal Register*. December 28, 1993. 58:68543-68554.

National Marine Fisheries Service (NMFS). 1993b. Designated critical habitat; Steller sea lion. *Federal Register*. August 27, 1993. 58:45269-45285.

National Marine Fisheries Service (NMFS). 1994a. Designated critical habitat, Northern right whale. *Federal Register*. June 3, 1994. 59: 28793.

National Marine Fisheries Service (NMFS). 1994b. Designated critical habitat, Steller sea lion. *Federal Register*. June 15, 1994. 59:30715-30716.

National Marine Fisheries Service (NMFS). 1995a. *Proposed recovery plan for Snake River salmon*. NMFS, Protected Resources Division, Portland, Oregon.

National Marine Fisheries Service (NMFS). 1995b. *Status review of the United States Steller sea lion (*Eumetopias jubatus*) population*. NMFS, National Marine Mammal Laboratory, Seattle, Washington.

National Marine Fisheries Service (NMFS). 1997. Threatened fish and wildlife; Change in listing status of Steller sea lions under the Endangered Species Act. *Federal Register*. May 5, 1997. 62:24345-24355.

National Marine Fisheries Service (NMFS). 1998. Endangered and Threatened Species: Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs; Proposed Redefinition, Threatened Status, and Revision of Critical Habitat for One Chinook Salmon ESU; Proposed Designation of Chinook Salmon Critical Habitat in California, Oregon, Washington, Idaho. *Federal Register*. March 9, 1998. 55:11482-11520.

National Marine Fisheries Service (NMFS). 1999. Endangered and threatened wildlife and plants; Definition of "Harm." *Federal Register*. November 8, 1999. 64: 60727-60731.

National Marine Fisheries Service (NMFS). 2000a. *Sei whale* (Balaenoptera borealis)*: Eastern North Pacific stock*. Revised December 15, 2000. <http://www.nmfs.noaa.gov/pr/PR2/Stock_Assessment_Program/Cetaceans/Sei_Whale_(ENP)/PO00seiwhale_ENP.pdf >.

National Marine Fisheries Service (NMFS). 2000b. *Blue whale (*Balaenoptera musculus*): Eastern North Pacific stock*. <http://www.nmfs.noaa.gov/pr/PR2/Stock_Assessment_Program/Cetaceans/Blue_Whale_(EasternN.Pacific)/PO00bluewhale_easternnpacific.pdf >.

National Marine Fisheries Service (NMFS). 2000c. Regulations governing the taking and importing of marine mammals; Cook Inlet beluga whales. *Federal Register*. June 22, 2000. 65:38778-38790.

National Marine Fisheries Service (NMFS). 2000d. Designating the Cook Inlet, Alaska, stock of beluga whale as depleted under the Marine Mammal Protection Act (MMPA). *Federal Register*. May 31, 2000. 65:34590-34597.

National Marine Fisheries Service (NMFS). 2001. Endangered fish and wildlife; Finding for a petition to revise critical habitat for northern right whales. *Federal Register*. June 1, 2001. 66:17560-17562.

National Marine Fisheries Service (NMFS). 2002a. Right whale calf sighted in Bering Sea. September 19, 2002 News Release. National Marine Fisheries Service. Alaska Region. Juneau, Alaska. <http://www.fakr.noaa.gov/newsreleases/2002/rightwhale.htm>.

National Marine Fisheries Service (NMFS). 2002b. Endangered fish and wildlife; Determination on a petition to revise critical habitat for northern right whale in the Pacific. *Federal Register*. February 20, 2002. 67:7660-7665.

National Marine Fisheries Service (NMFS). 2002c. Environmental Assessment Co-Management Agreement Between the National Marine Fisheries Service and the Cook Inlet Marine Mammal Council for the Year 2002. Alaska Regional Office, National Marine Fisheries Service, Juneau, Alaska.

National Marine Fisheries Service (NMFS). 2003a. Endangered fish and wildlife; Notice of technical revision to right whale nomenclature and taxonomy under the U.S. Endangered Species Act. *Federal Register*. April 10, 2003. 68:17560-17562.

National Marine Fisheries Service (NMFS). 2003b. Fin whale (*Balaenoptera physalus*): Northeast Pacific stock. <http://www.nmfs.noaa.gov/pr/PR2/Stock_Assessment_Program/Cetaceans/Fin_Whale_(Notheast_Pacific)/AK98finwhale_NortheastPacific.pdf >.

National Marine Fisheries Service (NMFS). 2003c. *Endangered Species Act Section 7 Consultation – Biological Opinion. Vessel quotas and operating requirements for Glacier Bay National Park and Preserve*. National Marine Fisheries Service, Protected Resources Division, Alaska Region. Juneau, Alaska.

National Marine Fisheries Service (NMFS). 2004. Endangered fish and wildlife; Advance notice of proposed rulemaking (ANPR) for right whale ship strike reduction. *Federal Register*. June 1, 2004. 69:30857-30864.

National Marine Fisheries Service (NMFS). 2005a. *Right whales*. <http://www.nmfs.gov/pr/species/mammals/cetaceans/right_whales.doc>. Accessed June 6, 2005.

National Marine Fisheries Service (NMFS). 2005b. *Humpback whales*. <http://www.nmfs.gov/pr/species/mammals/cetaceans/humpback_whales.doc>.

National Marine Fisheries Service (NMFS). 2005c. *Sperm whales*. <http://www.nmfs.gov/pr/species/mammals/cetaceans/spermwhales.htm>.

National Marine Fisheries Service (NMFS). 2005d. Draft Alaska Marine Mammal Stock Assessments 2005. July 2005. U.S Department of Commerce National Oceanic and Atmospheric Administration, National Marine Fisheries Service, National Marine Mammal Laboratory, Alaska Fisheries Science Center, Seattle WA.

National Marine Fisheries Service (NMFS). 2005e. Agreement between the National Marine Fisheries Service and the Cook Inlet Marine Mammal Council for the Co-management of the Cook Inlet Stock of Beluga Whale for the Year 2005. Alaska Regional Office, National Marine Fisheries Service, Juneau, Alaska.

National Marine Fisheries Service (NMFS). 2005f. Draft Conservation Plan for the Cook Inlet Beluga Whale (*Delphinapterus leucas*). March 16, 2005. U.S Department of Commerce National Oceanic and Atmospheric Administration, National Marine Fisheries Service, National Marine Mammal Laboratory, Alaska Fisheries Science Center, Protected Resources Division.

National Marine Mammal Laboratory (NMML). 2004a. *Detailed information about sperm whales*. National Marine Mammal Laboratory web site. Last update on April 5, 2004. <http://nmml.afsc.noaa.gov/education/cetaceans/sperm2.htm>.

National Marine Mammal Laboratory (NMML). 2004b. *Steller sea lion*. Multi-link web site to information on Steller sea lion management and research. <http://stellersealions.noaa.gov>.

National Research Council. 1983. *Drilling fluids and cuttings in the marine, environment*. Marine Board, panel on fates and effects of drilling fluids and cuttings in the marine environment. National Academy Press. Washington, D.C. 180 pp.

Neff, J.M. 1982. *Fate and biological effects on oil well drilling fluids in the marine environment: A literature review*. EPA-600/3-82-064. U.S. Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, FL. 150 pp.

Neff, J.M. 1991. *Technical Review of Document: Process Waters in Cook Inlet, Kenai, Alaska*. Reference 67519. Public Awareness Committee for the Environment, Kenai, AK.

Northwest Power Planning Council (NWPPC). 1989. *Snake River subbasin salmon and steelhead plan*. NWPPC, Portland, Oregon.

Ocean Biogeographical Information System (OBIS). 2005. *Balaenoptera physalus* (Fin whale). Duke University, North Carolina. <http://seamap.env.duke.edu/species/tsn/180527>

Ohsumi, S. and S. Wada. 1974. Status of whale stocks in the North Pacific, 1972. *Rept. Int. Whaling Commission* 25: 114-126.

Osborne, J. and C. Leeder. 1989. Acute and chronic toxicity of base oil and cuttings from three wells drilled in the Beaufort Sea. pp. 481-494. In: *Drilling Wastes, Proc. of the 1988 International Conference on Drilling Wastes*, Calgary, Alberta, Canada. F.R. Engelhardt, J.P. Ray, and A.H. Gilliam (eds). Elsevier Science Publishers Ltd., London, England.

Parrish, P.R., and T.W. Duke. 1990. Effects of drilling fluids on marine organisms. pp. 207-217. In: *Oceanic Processes In Marine Pollution*. Volume 6. D .J. Baumgartner and I .W. Duedall (eds.). Robert E. Krieger Publ. Co., Malabar, FL.

Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. *Mar. Fish. Rev*. Special Issue. 61(1): 1-74.

Petrazzuolo, G., A.D. Michael, C.A. Menzie, H. Plugge, E.J. Zimmerman, R.G. Rolan, T.A. Mores, L.A. Smith, W.K. Parland, and S.E. Roth. 1985. *Assessment of environmental fate of effects of discharges from offshore oil and gas operations*. EPA 440/4-85/002. Washington, D.C.

Porter, B. 1997. Winter ecology of Steller sea lions. Masters Thesis. University of British Columbia, Department of Zoology. November 1997.

Reeves, R.R. and H. Whitehead. 1997. Status of the sperm whale, *Physeter macrocephalus*, in Canada. *Canadian Field-Naturalist* 111:293-307.

Rice, D. 1989. Sperm whale, *Physeter macrocephalus*. Pp. 177-233. In: S.H. Ridgway and R. Harrision (eds.), *Handbook of Marine Mammals*. Vol. 4. River Dolphins and the Larger Toothed Whales. Academic Press, New York.

Richardson, J.R. 2003. When ships come in. *National Parks Conservation Association Magazine* July/August 2003. <http://www.npca.org/magazine/2003/july_august/ships.asp>.

Riedman, M.L. 1983. *Studies of the Effects of Experimentally Produced Noise Associated with Oil and Gas Exploration and Development on Sea Otters in California*. OCS Study, MMS Alaska ESU 83-021. USDOI, MMS, Alaska OCS Region, Anchorage, AK.

Riedman, M.L. 1984. Effects of Sound Associated with Petroleum Industry Activities on the Behavior of Sea Otters in California, Appendix D. Investigations of the Potential Effects of Underwater Noise from Petroleum Industry Activities on Migrating Gray Whale Behavior: Phase II. USDOI, MMS, Alaska OCS Region, Anchorage, AK.

Romano, T.A., M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and J.J. Finneran. 2004. Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. *Can. J. Fish. Aquat. Sci*. 61: 1124-1134.

Tetra Tech. 1993. *Ocean Discharge Criteria Evaluation for Cook Inlet/Shelikof Strait Oil and Gas Lease Sale 149*. Prepared for U.S. Environmental Protection Agency, Region 10. Tetra Tech, Inc. Redmond, WA.

Tetra Tech. 2004. *Preliminary Draft Biological Evaluation of the Alaska Water Quality Standards*. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Tetra Tech, Inc., Mountlake Terrace, WA.

Tillman, M.F. 1977. Estimates of population size for North Pacific sei whale. *Rept. Int. Whaling Commission*, Special Issue 1: 98-106.

Trites, A. and K. Heise. 2005. *Marine mammals*. <http://www.fisheries.ubc.ca/Projects/ PWSound/AlaskaEco/GYRE/GYRREP15.HTM>. Accessed July 14, 2005.

U.S. Army Corps of Engineers (USACE). 2003. *Natural resource management section adult fish counts: 2003 YTD running sums for adult fish count—Lower Granite*. Available online at: <https://www.nwp.usace.army.mil/op/fishdata/runsum2003.htm>.

U.S. Environmental Protection Agency (USEPA). 1984. *Final ocean discharge criteria evaluation, Diapir Field OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a*. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

U.S. Environmental Protection Agency (USEPA). 1985. *Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses*. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratories, Duluth, MN.

U.S. Environmental Protection Agency (USEPA). 1988a. *Final ocean discharge criteria evaluation for Beaufort Sea OCS oil and gas lease offering 97.* U.S. Environmental Protection Agency, Region 10, Seattle, WA.

U.S. Environmental Protection Agency (USEPA). 1988b. *Final ocean discharge criteria evaluation for Chukchi Sea OCS oil and gas lease offering 109.* U.S. Environmental Protection Agency, Region 10, Seattle, WA.

U.S. Environmental Protection Agency (USEPA). 1993. *Development document for effluent limitations guidelines and new source performance standards for the offshore subcategory of the oil and gas extraction point source category. Final (EPA-821-R-93-003)*. U.S. Environmental Protection Agency, Office of Science and Technology, Engineering and Analysis Division, Washington, DC.

U.S. Environmental Protection Agency (USEPA). 1996. *Development Document for Final Effluent Limitations Guidelines and Standards for the Coastal Subcategory of the Oil and Gas Extraction Point Source Category (EPA-821-R-96-023)*. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

U.S. Environmental Protection Agency (USEPA). 2000. *Environmental assessment of final effluent limitations guidelines and standards for synthetic-based drilling fluids and other non-aqueous drilling fluids in the oil and gas extraction point source catego*ry (EPA-812-B00-014). U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

U.S. Fish and Wildlife Service (USFWS). 2000a. Endangered and threatened wildlife and plants; Final rule to list the short-tailed albatross as endangered in the United States. *Federal Register*. July 31, 2000. 65:46643-46654.

U.S. Fish and Wildlife Service (USFWS). 2000b. Endangered and threatened wildlife and plants; Proposed designation of critical habitat for the Steller's eider. *Federal Register*. March 13, 2000. 65:13262-13284.

U.S. Fish and Wildlife Service (USFWS). 2001. Endangered and threatened wildlife and plants; Final determination of critical habitat for the Alaska-breeding population of the Steller's eider. *Federal Register*. February 2, 2001. 66:8850-8884.

U.S. Fish and Wildlife Service (USFWS). 2002. *Steller's eider recovery plan*. U.S. Fish and Wildlife Service. Region 7. Anchorage, Alaska. 27 pp.

U.S. Fish and Wildlife Service (USFWS). 2003. *Alaska's threatened and endangered species*. USFWS, Alaska Region. Anchorage, AK.

U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and threatened wildlife and plants; Determination of threatened status for the southwest Alaska distinct population segment of the northern sea otter (*Enhydra lyutris kenyoni*). *Federal Register*. August 9, 2005. 70:46366-46386.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 1998. Endangered Species Consultation Handbook. Procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. USFWS and NMFS.

Waples, R.S., R.P. Jones, Jr., B.R. Beckman, and G.A. Swan. 1991. *Status review for Snake River fall chinook salmon*. U.S. Department of Commerce, NOAA Tech. Memo. NMFS F/NWC-201. 73 pp.

World Wildlife Fund (WWF). 2005. *Sei whale*. <http://www.panda.org/news_facts/education/university/species/showspecies.cfm?SID=46&LID=2&FH=E >.